PROTEA
Survey Instruments

USER MANUAL

28 Boomkruiper Street
Birch Acres Ext.7
Kempton Park
South Africa

Tel: 011 976-2070
Fax: 011 976-3733
E-mail: sales@protsurv.co.za

Plot 170, Unit 4
International Commerce Park
Gaborone
Botswana

Tel: 312-1146
Fax: 312-1406
E-mail: protsurv@botsnet.bw

Precaution

1. If the instrument has not been used for a long time, check it regularly (3 months)
2. Avoid shocking or bumping
3. No using in high dusty, not well ventilated, and easy burning environment
4. No dismount and mount the instrument by yourselves
5. Prohibit to see the sun with telescope
6. Cover with umbrella in burning sun or rainy day
7. Cover the instrument with rainy cover
8. Power off before taking off battery, or the data will be lost
9. Place instrument the case and avoid humidity
10. Prohibit move the instrument with tripod
11. It will cause measuring result is not correct if there is leaves and obstacle between the target and the instrument
12. Place the instrument like the picture below:

13. **Contact me if you got any problem**

User

1） Only those qualified people who own measuring knowledge can use the instrument
2） Wear safety uniform such as safety shoe and headgear

Declaration

We won’t afford any responsibility if following conditions occur:

1) Damage caused by drop, extrusion, soaking, wetting and other man-made damage.
2) Cycle inspection, protection, repair or component replacement caused by normal abrasion.
3) Damage caused flood, fire, lighting stroke and other natural disaster.
4) Malfunction of products due to not following protection instruction of product instruction book.
5) The instrument that have been repaired by repair center having no authority won’t be accepted by us.

Contents

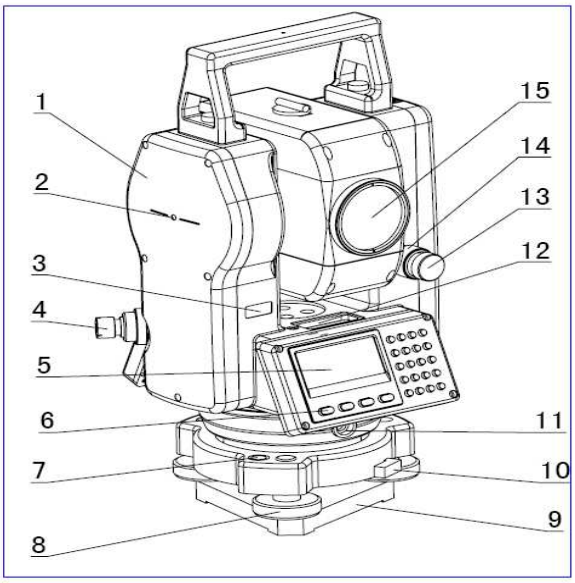
Brief Introduction

1. Description of All Parts 5
1.1 Name of Parts 6
1.2 Display 7
1.3 Operation Key 8
1.4 Function Key 9
1.5 RS 232 10
2. Battery 10
2.1 Battery Replacing 10
2.2 Battery Recharging 10
3. Measurement Preparation 11
3.1 Instrument Setting Up 11
3.2 Instrument Leveling 11
3.3 Centering with optical plummet 12
3.4 Eyepiece Adjustments and Object Sighting 12
3.5 Power on 12
3.6 Power off 13
3.7 Turn on/off Back light 13
3.8 Input way of Alphanumeric Characters 13
3.9 Turn on/off Compensator (Tilt) 14
4. Angle Measurement 15
4.1 Measuring Horizontal Angle Right and Vertical Angle 15
4.2 Switching Horizontal Angle Right/Left 16
4.3 Setting of Horizontal Angle 17
4.4 Vertical Angle Percent Grade (%) Mode 18
4.5 Compasses (vertical angle) 19
5. Distance Measurement 19
5.1 Setting of Atmospheric Correction 19
5.2 Setting of the Correction for Prism Constant 19
5.3 Distance Measurement 20
5.4 Distance Measurement (Mode of Horizontal Distance & Height Distance) 21
5.5 Setting of Mode of Distance Measurement 22
5.6 Offset Measurement 23
5.7 S.O.(Distance) 24
6. Coordinate Measurement 25
6.1 Steps of Coordinate Measurement 25
6.2 Setting Up Coordinate of Station Point 26
6.3 Setting Up Height of Prism 30
6.4 Setting Up Back sight 31
6.5 Coordinate Measurement 35
7. Data Collection 37
7.1 Preparation 37
7.2 Operation Steps 39
7.3 Select File of Data Collection 40
7.4 Setting Up Station Point 40

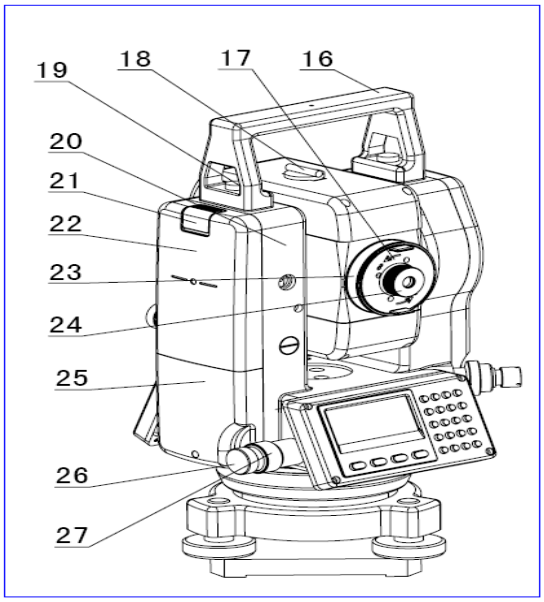
7.5 Setting Up Back sight 43
7.6 Data Collection 46
8. S.O 47
8.1 Steps of S.O 47
8.2 Selection of Coordinate Data File 47
8.3 Setting Up Station Point 48
8.4 Setting Up Back sight Point 51
8.5 S.O 54
8.6 Resection 57
9. Application Program 60
9.1 REM 60
9.2 MLM 63
9.3 Area Measurement 65
10. Memory Management 68
10.1 Enter into Mode of Memory Management 68
10.2 File Management & Search Data 69
10.3 Input Coordinate Point & Create File 71
10.4 Delete Coordinate Point 72
10.5 Data Communication 74
10.6 Initializing Memory 76
11. Parameter Setting Up 77
11.1 Enter into Setting up Parameter 77
11.2 Setting up Power off Automatically 77
11.3 Setting up Position 0(Vertical Angle) 78
11.4 Setting up Compensator 78
11.5 Setting up Angle Unit 79
11.6 Setting up Minimum Reading 79
11.7 Setting up Distance Unit 79
11.8 Setting up Data Storing 80
11.9 Saving Setup 80
11.10 Contrast Adjusting 80
12. Compensator 81
12.1 Enter into Mode of Compensator Adjusting 81
12.2 Position 0 Check 82
12.3 Position 0 Changing 82
12.4 Position 0 Adjusting 83
12.5 Accuracy Check 84
13. Check & Adjustment 85
13.1 Check & Adjustment of Constant 85
13.2 Check & Adjustment of Plate Vial 86
13.3 Check & Adjustment of Circular Vial 86
13.4 Check & Adjustment of Optical Plummet 87
13.5 Check & Adjustment of Inclination of Reticle 87
13.6 Check & Adjustment of Perpendicularity of line of sight to Horizontal Axis (c) 88
13.7 Check & Adjustment of Vertical Index Difference (i angle) 88
13.8 Check of Parallel between Line of Sight and Emitting Photoelectric Axis ..... .89
14. Technical Index 90
15. Packing List 92

1. Description of All Parts

1.1 Names of Parts



1	Side Cover (Left)	**6**	Function Key	**11**	Data Port
2	Instrument Center Mark	**7**	Circular Vial	**12**	Plate Vial
3	Series No.	**8**	Leveling Screw	**13**	Vertical Tangent Screw
4	Optical Plummet	**9**	Base	**14**	Vertical Clamp Screw
5	Display	**10**	Connection Knob on Base	**15**	Objective Lens



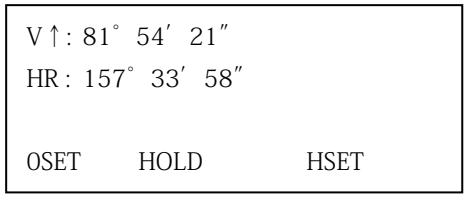
16	Handle	**20**	Frame	**24**	Eyepiece
17	Telescope Grip	**21**	Battery locking Lever	**25**	Side Cover(Right)
18	Collimator	**22**	Battery	**26**	Horizontal Tangent crew
19	Handle Screw	**23**	Telescope Focusing Knob	**27**	Horizontal Clamp Screw

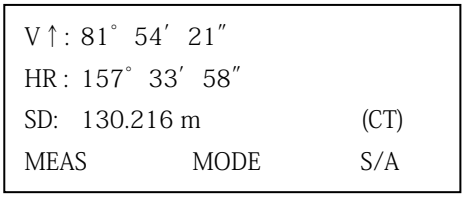
1.2 Display

The dot matrix LCD can display 4 lines of characters and numbers. Each Line can display 20 characters. Normally the first 3 lines show measured data while the last line shows the function of the measurement mode.

There are two modes on display: Measurement Mode & Menu Mode

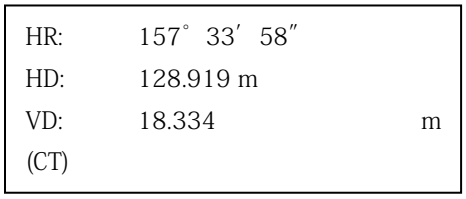
- Display(example)

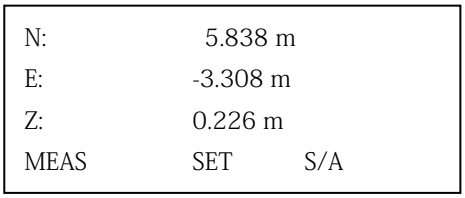




Mode of Angle Measurement
Vertical angle: 81°54′21″
Horizontal angle: 157°33′58″

Mode of Distance Measurement 1
Vertical angle : 81°54′21″
Horizontal angle :157°33′58″
Slope Distance: 130.216 m

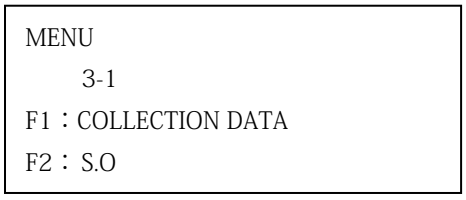


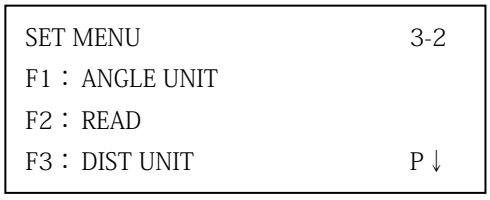


Mode of Distance Measurement 2
Horizontal Angle: 157°33′58″
Horizontal Distance: 128.919 m
Height Distance: 18.334 m

Mode of Coordinate Measurement
Coordinate(north):N/X 5.838 m
Coordinate(east):E/Y -3.308 m
Height Distance :Z/Z 0.226 m

- Mode of Menu(example):





Main Menu(Page 1)
Press F1 enter into “COLLECTION DATA”
Press F2 enter into “S.O”
Press F3 enter into “MEMORY MANAGE ”

Setup Submenu(Page 2)
Press F1 enter into “ANGLE UNIT”
Press F2 enter into “READ”
Press F3 enter into “DIST UNIT”

- Display Symbols

Symbol	Contents
V	Vertical Angle
V↑	Mode in which zenith of vertical angle is 0
V→	Mode in which horizontal of vertical angle is 0
%	Gradient Display
HR	H-angle right
HL	H-angle left
SD	Slope distance
HD	Slope distance
VD	Elevation difference
N	N coordinate
E	E coordinate
Z	Z coordinate
DSD	S.O. difference of slope distance
DHD	S.O. difference of horizontal distance
DVD	S.O. difference of height distance
(CT)	Fine Measurement
(TR)	Track Measurement
(1)	Single Measurement
OUT	Vertical Angle is out of compensator range or slope is over ±100%
°’ “	Set 360°as angle unit
GON(g)	Set 400 gon as angle unit
MIL	Set 6400 mil as angle unit
P1/P2/P3	Page 1/Page 2/Page 3
M	Meter unit
Ft	Feet unit
SING(150)	测距光强值为 150

1.3 Operation Key

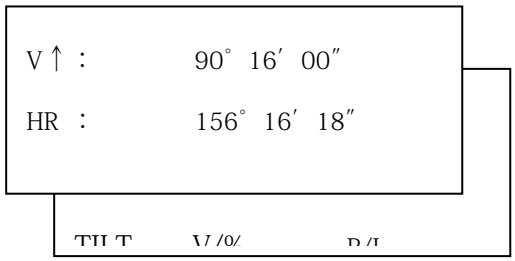
Key	Function 1	Function 2
F1-F4	Function of fourth line	Refer to picture
0-9	Input number	Input character &special symbol
-	Input minus	
.	Input point	
ESC	Escape	

ENT	Enter	
□	Back light & Contrast adjusting	
POWER	Power on/off	
MENU	Enter into main menu	Move to right
	Enter into coordinate measurement	Move to left
	Enter into Distance Measurement	HD/SD/HD、 move to upside
ANG	Enter into angle measurement	Enter into down

1.4 Function Key

The fourth line on screen is Function Key, which differs from the different measurement mode.

Mode of Angle Measurement



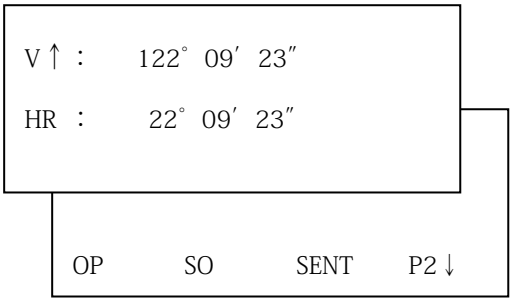
↓　↓　↓　↓

F1　F2　F3　F4

Page	Function Key	Symbol Display	Function
Page 1 (P1)	F1	0SET	Set horizontal angle as 0°00′00″
	F2	HOLD	Hold the horizontal angle
	F3	HSET	Set a required horizontal angle by entering numerals
	F4	P1↓	The function of soft keys is shown on next page (P2)

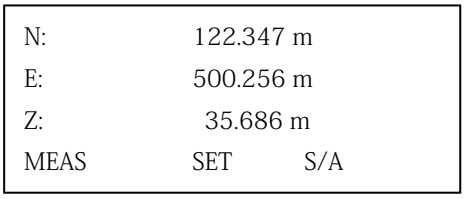
Page 2 (P2)	F1	TILT	Setting tilt correction If On. The display shows tilt correction value.
	F2	V/%	Vertical angle percent grade (%) mode
	F3	R/L	Switches R/L rotation of horizontal angle
	F4	P2↑	The function of soft keys is shown on next page (P1)

Mode of Distance Measurement



Page	**Function Key**	**Symbol Display**	**Function**
Page 1 (P1)	F1	MEAS	Start measuring
	F2	MODE	Sets a measuring mode, Fine/Tracking/Single
	F3	S/A	Sets temperature, air pressure, prism constant
	F4	P1↓	The function of soft keys is shown on next page (P2)
Page 2 (P2)	F1	OP	Selects Off-set measurement mode
	F2	SO	Selects Staking-out measurement mode
	F3	SENT	Sent data
	F4	P2↓	The function of soft keys is shown on Page 1.

Mode Of Coordinate



Page	Function Key	Symbol Display	Function
	F1	MEAS	Start measuring
	F2	SET	Sets mode of station point, backsight point and prism height
	F3	S/A	Sets temperature, air pressure, prism constant
	F4	SENT	Sent data

1.5 RS232

RS232 is used to connect the Total Station with computer or PC to transfer measured data to computer or PC, or to transfer preset data of coordinate to the Total Station.

2. Battery

2.1 Battery replacing

1、 Battery Insert
Insert battery correctly. Check and insert battery holder true to side into the housing.

2、 Battery Removing
Remove battery and replace.

2.2 Battery Charging

1、 Insert recharger into battery's hole.

2、 Insert the plug of the recharger into 220V AC power supply.

3、 It shows green light after finishing recharging.

4、 Cut the power supply of the recharger and drew the battery out from the recharger.

Notes:
1. It's recharging when the red light shows.
2. Normally it takes 7 hours for recharging, but it must be 12-15 hours for the first time.
3. Recharging temperater:0°- ±45°C.
4. Recharging times: 300-500 times.

3. Measurement Preparation

3.1 Instrument Setting Up

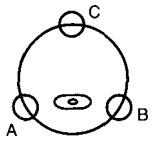
1) Setting up the tripod
Pull out to required length and tighten screws.

2) Place the INSTRUMENT onto the tripod head.
Tighten central fixing screw of tripod.

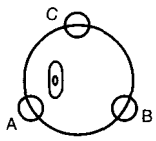
3.2 Instrument leveling

1) Level the instrument with circular vial.

a. Turn the leveling screw A and B to move the bubble in the circular vial. The bubble is now located on a line perpendicular to a line running through the centers of the two leveling screw being adjusted.

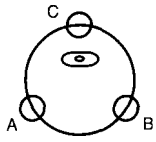


b. Turn the leveling screw C to bring the bubble to the center of the circular vial.



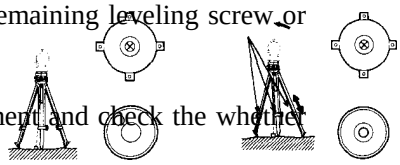
1、 Level the INSTRUMENT with plate vial.

a. Rotate the instrument horizontally by loosening the Horizontal Clamp Screw and place the plate vial parallel with the line connecting leveling screw A and B, and then bring the bubble to the center of the plate vial by turning the leveling screws A and B.



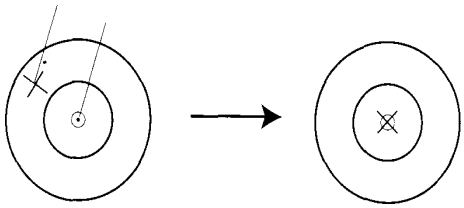
b. Rotate the instrument 90º(100g) around its vertical axis and turn the remaining leveling screw or leveling C to center the bubble once more.

c. Repeat the procedures A&B for each 90º(100g) rotation of the instrument and check the whether the bubble is correctly centered for all four points.



3.3 Centering by optical plummet

Adjust the eyepiece of the optical plummet telescope to your eyesight. Slide the instrument by loosening the Tripod screw, place the point on the center mark of the optical plummet. Sliding the instrument carefully not to rotate that allows you to get the least dislocation of the bubble.



Note: Centering by foot screw first and then leveled-up by tripod.

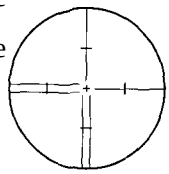
3.4 Eyepiece Adjustments and Object Sighting

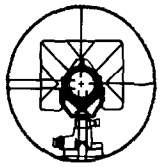
Method of Object Sighting（for reference）

①Sight the Telescope to the sky and rotate the eyepiece tube to make the triangle clear.

②Collimate the target point with top of the triangle mark in the collimator. (keep a certain distance between eye and the collimator).

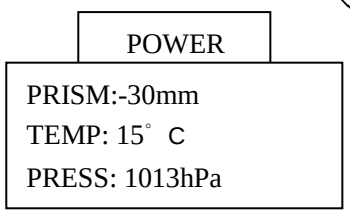
③Make the target image clear with the telescope focusing screw. If there parallax when your eye move up, down or left, right, that show the diaper of eyepiece lens or focus is not adjusted well and accuracy will be influenced, so you should adjust the eyepiece tube carefully to eliminate the parallax.





3.5 Power on

① Leveling INSTRUMENT



② Push Key Power (red)

③ Turn telescope to initial the INSTRUMENT.
Confirm the battery is full, if not so,
Please replace and recharge the battery.
Check Prism constant, temperature
and atmosphere press.

```
FYTS
V ANGLE 0 SET
TURN TELTSCOPE
```

```
V↑: 81° 54′ 21″
HR: 157° 33′ 58″

0SET  HOLD  HSET
```

3.6 Power off

Push key Power (red).

3.7 Turn on/off back light

Push Key□、and then press Key F1:turn on LCD back light, Press Key F1:turn off LCD back light.

3.8 Input way of Alphanumeric Characters

It's easy and simple to input alphanumeric characters by keyboard.

[Example 1]Select items of PtID, ID, INS. HT and * on the mode of data collection.

```
PtID:*                    2-1
ID:
INS. HT:        - 0.001   m
INPUT
```

Press[F1] to enter input menu Press [F3] to enter into characters menu

（input alphanumeric） (123 and ABC changes in turn when pressing[F3])

```
PtID:=  DTM-DAD
ID:

INS.HT:              -0.001  m
```

```
PtID;=  DTM-DAD
ID:

INS.HT:              -0.001  m
```

Press [F3] to select mode of characters input

Press [8] to input D.（the letters differ from D, E, F, d, e, f in turn, if you press [8] again.

Press [1] twice after the cursor moves to next position. Input T.

Press [5], input M.

Input -、D、A 、D. The PtID is DTM-DAD.

Note: Input it again if input wrongly (Press [F1]).

[Example 2] Input angle under the mode of angle measurement.

H ANGLE SET (DEG)
HR:=190.5943
DEL --- 123 ENTER

Press [1] to input 1
Press [9] to input 9
Press [0] to input 0
Press [.] to input .
Press [5] to input 5
Press [9] to input 9
Press [4] to input 4
Press [3] to input 3

Press [F4] （ENTER）， HR is "190°59′43″"

Note: It only can input alphanumeric in this mode. Input it again if input wrongly, press[F1](DEL)

Use "." between degree and minute, but not between minute and second.

Press ENTER after inputting alphanumeric， it shows degree, minute and second automatically.

3.9 Turn on/off Compensator (Tilt)

When the compensator is activities, automatic correction of vertical angle for mislevelment is displayed. To ensure a precise angle measurement, compensator must be turned on. The display can also be used to fine level the instrument. If the (TILT OVER)display appears the instrument is out of the automatic compensation range and must be leveled manually.

When the instrument is on an unstable stage or a windy day the display of vertical angle is unstable. You can turn off the auto tilt correction function of vertical angle in this case.

Set tilt correction by software（two ways）。

[Example 1]Setting Tilt Off/On.(It saves after powering off.)

Operation Procedure	Operation	Display

1.Press [MENU] to enter into main menu 3-1 in the mode of angle measurement. Press [F4] to enter into main menu 3-2.	[MENU] [F4]	MENU 3-1 F1:COLLECTION DATA MENU 3-2 F1:PROGRAMS F2:SET
2.Press [F2] to enter into parameter setting, page 3-1	[F2]	SET MENU 3-1 F1:POWER AUTO [ON] F2:CMPS [V↑ :] F3:TILT [OFF] P↓
3.Press [F3]to set compensator as [OFF] or [ON]	[F3]	SET MENU 3-1 F1:POWER AUTO [ON] F2:CMPS [V↑ :] F3:TILT [ON] P↓
4.Press [F4] twice to enter into parameter setting. MENU Page 3-3 Press[F3] to save and escape.	[F4] [F4] [F3]	SET MENU 3-3 F1:POWER AUTO[ON] F2:CMPS[V↑ :] F3:TILT[ON] P↑ MENU 3-2 F1:PROGRAMS F2:SET F3:LCD P↓

[example 2]Setting Tilt correction（It doesn't save data after Power off)

1.Press[F4]to enter into mode of angle measurement(Page 2) in the mode of angle measurement.	[F4]	V↑: 90° 16′ 00″ HR: 156° 16′ 18″
2:Press[F1](TILT)	[F1]	TILT SENSOR [X-OFF] X: X-ON X-OFF ----

3.Press[F1]or[F2] to select compensator[ON]or[OFF]. It shows tilt value if compensator was ON.	[F3]	TILT SENSOR [X-ON] X: 0° 00′ 30″ X-ON X-OFF ----
4)Press[F4](ENTER)to escape.	[F4]	V↑: 90° 16′ 00″ HR: 156° 16′ 18″

4. Angle Measurement

4.1 Measuring Horizontal Angle Right and Vertical Angle

Make sure the mode is in Angle measurement.

Operation Procedure	Operation	Display
1.Aim at the first target A.	Aim at A	V↑: 82° 09′ 30″ HR: 90° 09′ 30″ 0SET HOLD HSET
2.Set horizontal reading of target A as 0°00′00″. Press[F1](0SET)and [F3] (YES)	[F1] [F3]	H ANGLE 0 SET > OK ? --- --- YES NO V↑ : 82° 09′ 30″ HR : 0° 00′ 00″ 0SET HOLD HSET

3.Aim at the second target B. The required V/H angle to target B will be displayed.	Aim at target B	V↑： 82° 09′ 30″ HR ： 57° 13′ 48″ 0SET HOLD HSET

Reference: How to Collimate

1. Point the telescope toward the light. Turn the diaper ring and adjust the diaper so that the cross hairs are clearly observed.

(Turn the diaper toward you first and then backward to focus).

2. Aim the target at the peak of the triangle mark of the sighting collimator. Allow a certain space between the sighting collimator and yourself for collimating.

3. Focus the target with the focusing knob

If parallax is created between the cross hairs and the target when viewing vertically or horizontally while looking into the telescope, focusing is incorrect or diopter adjustment is poor. This adversely affects precision in measurement or survey; eliminate the parallax by carefully focusing and using diaper adjustment.

4.2 Switching Horizontal Angle Right/Left

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
1.Press [F4](P1↓)to enter into mode of angle measurement, Page 2, in the mode of angle measurement.	[F4]	V↑: 90° 16′ 00″ HR: 156° 16′ 18″
2.Press [F3](L/R).The mode Horizontal angle Right (HR) Switches to (HL) mode. 3.Measure as HL mode.	[F3]	V↑： 122° 09′ 23″ HL ： 269° 50′ 17″ TILT V/% R/L
Every time pressing the [F2](R/L) key, HR/HL mode switches.		

4.3 Setting of Horizontal Angle

1. Setting by Holding the Angle

Make sure the mode is angle measurement

Operation Procedure	Operation	Display
1.Set the required horizontal angle, using Horizontal tangent screw	Angle Display	V↑: 122° 09′ 30″ HR: 90° 09′ 30″ 0SET HOLD HSET
2.Press the [F2](HOLD)key.	[F2]	H ANGLE HOLD HR: 90° 09′ 30″ > SET : --- --- YES NO
3.Aim at the target（□1）	Aim	
4.Press the [F3](YES)key to finish holding the horizontal angle.*1) The display turns back to normal angle measurement mode.	[F3]	V↑: 122° 09′ 30″ HR: 90° 09′ 30″ 0SET HOLD HSET
（□1）To return to the previous mode, press the [F4](NO)Key		

2. Setting Horizontal Angle from the Keys

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
1.Aim at the target	Aim	V↑: 122° 09′ 30″ HR: 90° 09′ 30″ 0SET HOLD HSET
2.Press the [F3](HSET)key	[F3]	H ANGLE SET(DEG) HR: = DEL --- 123 ENTER

3.Input the required horizontal angle （□1） by pressing F1(Input). Example：150°10′20″ （Input 150.1020）□2 Press [F4] (Enter) after inputting alphanumeric. It returns to normal monde of angle measurement.	[F1] [F4]	H ANGLE SET(DEG) HR: = DEL --- 123 ENTER V↑： 122° 09′ 30″ HR ： 150° 10′ 20″ 0SET HOLD HSET
□1.Press [F1](Del)if inputting wrongly, or press[ESC](escape)to input correct value again. □2.It shows setting failed if wrong value was input. Input it again.		

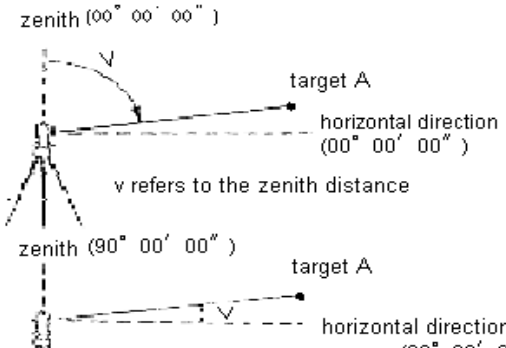
4.4 Vertical Angle Percent Grade (%) Mode

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
1.Press the [F4](P↓)Key to get the function on page 2	F4	V↑: 122° 09′ 30″ HR: 150° 10′ 20″ 0SET HOLD HSET TILT V/% R/L
2.Press the [F3](V%)（□1）	[F3]	V↑: 0.99% HR: 150° 10′ 20″ TILT V/% R/L
（□1）Every time pressing the [F3](V%)key, the display mode switches When the measurement is carried out over±45º(±100%)from the horizontal, the display shows<OUT>		

4.5 Compasses (vertical angle)(Refer to 11.3)

Vertical angle is displayed as shown below:



5. DISTANCE MEASUREMENT

Check setting of atmosphere correction & prism constant before measuring distance.

5.1 Setting of the Atmospheric Correction

Preset temperature constant as 15℃. Input temperature manually（Range: -20℃～+50℃）

Preset atmosphere press as 1013hPa. Input temperature manually（Range: 533 hPa～1332 hPa）

1hPa=0.75mmHg

It saves after powering off.

5.2 Setting of the Correction for Prism Constant

Prism Constant value is -30.Set correction for prism at -30.If the prism is of another manufacturer, the appropriate constant shall be set beforehand. Constant range: -999mm～+999mm。The setting value is kept in the memory even after power is off.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press to enter into mode of distance measurement, Page 1 in the mode of angle measurement.		V↑： 81° 54′ 21″ HR ： 157° 33′ 58″ SD： (CT) MEAS MODE S/A
□Press[F3]	[F3]	F1：PRISM= -30mm F2：TEMP= 15° C F3：PRESS 1013 hPa
□Press[F1]to enter into prism constant setting. Refer to 3.8. Press[ENT] after inputting alphanumeric. Press[F2]to enter into temperature constant setting. Refer to 3.8. Press[ENT] after inputting alphanumeric.	[F1] [F2]	F1：PRISM=| mm F2：TEMP= 15° C F3：PRESS 1013 hPa F1：PRISM= -30 mm F2：TEMP=| ° C F3：PRESS 1013 hPa

Press[F3]to enter into atmosphere constant setting. Refer to 3.8. Press[ENT] after inputting alphanumeric. Press [ESC]to return to the mode of distance measurement, Page 1 after correction.	[F3]	

5.3 Distance Measurement（SD）

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press to enter into mode of distance measurement.		V↑： 122° 09′ 30″ HR ： 90° 09′ 30″ （CT） SD ： SIGN：155
□Aim at Prism center. □Press[F1]（MEAS）.(□1) Press[F1] （MEAS） again to stop distance measurement. It shows measurement result □2）～ □5）	[F1] [F1]	V↑： 122° 09′ 30″ HR ： 90° 09′ 30″ （CT） SD ： 336.551 m HR： 122° 09′ 23″ HD： 235.343 m （CT） VD： 36.551 m
□Clear value of distance by pressing any key	Any key	V↑： 90° 09′ 20″ HR ： 172° 17′ 23″ （CT） VD ： MEAS MODE S/A
□1）It shows “SING：***”on the screen when the instrument check the light intense. □2）It buzzes when it shows measuring result.		

□ 3）Measuring result differs from setting of different mode of measurement.

□ It shows present measuring result when the mode is in Single mode.
It shows each measuring result when the mode is in fine mode.

□4）Press to change horizontal distance and height distance.

□5）It keeps distance measurement if target was covered by something such as branch, but within 5 seconds.

Or the memory shows the distance from the instrument to the branch. Hence, to make sure it has no obstacle between the instrument to prism.

5.4 Distance Measurement（HD、 SD）

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press twice to enter into the mode of HD/SD.	 	HR： 122° 09′ 23″ HD： （CT） VD：
□Aim at prism center □Press[F1]（MEAS）to start measurement □1） Press[F1]（MEAS）again to stop measurement. It shows measuring result □2）～□4）	[F1] [F1]	HR： 122° 09′ 23″ HD： 235.343 m （CT） VD： 36.551 m
□Clear measuring value by pressing any key.	Any key	HR： 122° 09′ 23″ HD： （CT） VD：

□1）It shows “SING：***”on the screen when the instrument check the light intense.

□2）It buzzes when it shows measuring result.

□ 3）Measuring result differs from setting of different mode of measurement.

□ It shows present measuring result when the mode is in Single mode.
It shows each measuring result when the mode is in fine mode.

□4）Press to change into slope distance.

5.5 Setting of Mode of Distance Measurement

There are three modes of distance measurement: Fine Measurement, Tracking and Single Measurement. The memory doesn't save this setting after powering off. The default setting is Fine Measurement.

Mode of Fine Measurement：Normally it will be used. Higher accuracy, much time.

Measuring time：＜3 second（the first time）

Display unit：0.001m or 0.001ft

Mode of Tracking： Less time, lower accuracy. It only shows like this: 1cm

Measuring time：＜0.8 second

Display unit：0.01m or 0.01ft

Mode of Single Measurement: It is Fine Measurement incontinuouslly. Measuring times is only once.

Measuring time：＜3 second

Display unit：0.001m or 0.001ft

Setting the instrument to page 1(mode of distance measurement)

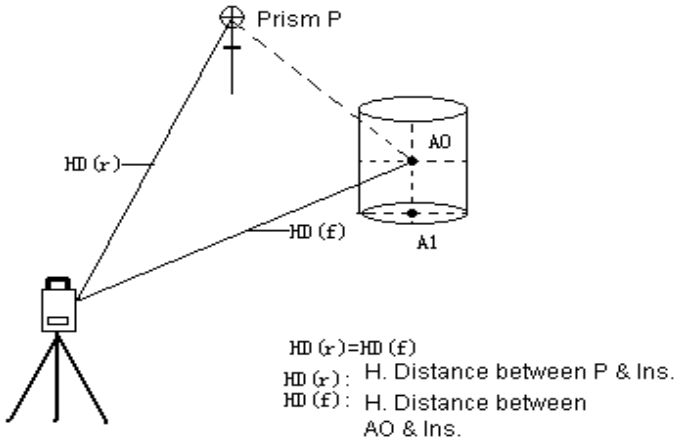
Operation Procedure	Operation	Display
□Press[F2]（MODE）.□1）	[F2]	V↑： 90° 09′ 20″ HR ： 172° 17′ 23″ (CT) SD ： MEAS MODE S/A
□Press[F1]（CT） to select mode of fine measurement. Press[F2]（TRAC） to select mode of Tracking. Press[F3] （ SINGLE ） to select mode of Single measurement.	[F1] [F2] [F3]	V↑： 90° 09′ 20″ HR ： 172° 17′ 23″ (CT) SD ： FINE TRAC SINGLE V↑： 90° 09′ 20″ HR ： 172° 17′ 23″ (CT) SD ： MEAS MODE S/A
□1） Press [ESC]to cancel the setting.		

5.6 Offset Measurement

This mode is useful when it is difficult to set up the prism directly, for example at the center of a tree. Place the prism at the same horizontal distance from the instrument as that of point A0 to measure. To measure the coordinates of the center position, operate the offset measurement after setting the instrument height/prism height.

When measuring coordinates of ground point A1: Set the instrument height/Prism height.

When measuring coordinates of point Ao :Set the instrument height only(Set the prism height to 0).



Confirm the instrument is in the mode of distance measurement.

Operation Procedure	Operation	Display
□Press[F4]to enter into the mode of distance measurement, page 3,in the mode of distance measurement.	[F4]	V↑： 122° 09′ 30″ HR ： 90° 09′ 30″ （CT） SD ： 336.551 m
□Press[F1]（OFFSET）	[F1]	OFFSET HR ： 90° 09′ 30″ HD ： MEAS ---- ---- ENTER

□Aim to position P（Put prism in the position P）	Aim at P	
□Press[F1]（MEAS）to measure the distance between instrument and prism.	[F1]	OFFSET HR ： 90° 09′ 30″ HD ： 35.665m MEAS ---- ---- ENTER
□Aim at target A（Center point of the column）	Aim at A	
□Press[F4]（ENTER).It shows the angle and distance of target A. □1）□2）	[F4]	OFFSET HR： 122° 09′ 23″ VD： 7.339m NEXT ---- ---- ----
□1）Press[F1]（NEXT）to measure next point and press [ESC] to escape. □2）Press to display VD、SD、HD in turn.（the third line）； Press to display N、E、Z（the third line）。		

5.7 Stake Out (S.O.)

The difference between the measured distance and the input stake out distance is displayed.

Measured distance-Stake out distance=Displayed value

●It can do any kind of S.O. of distance measurement such as HD,VD and SD.

Operation Procedure	Operation	Display
□Press[F4]to enter into mode of distance measurement, Page 2,in the mode of distance measurement.	[F4]	V↑： 122° 09′ 30″ HR ： 90° 09′ 30″ （CT） SD ： 336.551 m
□Press[F2]（S.O.）to show the data set last time	[F2]	STAKE OUT HD： 50.000m HD VD SD ---
□Press[F1] ～ [F3]to select mode of measurement. F1：HD	[F1]	STAKE OUT HD： 50.000m INPUT --- --- ENTER

<table>
<tr><td>F2：VD

F3：SD

Example：Horizontal distance</td><td></td><td></td></tr>
<tr><td>□Input distance of S.O.（□1）50m</td><td>[F1]
Input
50
[F4]</td><td>STAKE OUT
HD： 50.000m

INPUT --- --- ENTER</td></tr>
<tr><td>□Aim at target（Prism），
Press[F1]to start measuring. It shows the difference between distance of measuring and S.O.</td><td>Aim at P

[F1]</td><td>HR： 120° 09′ 23″
dHD：
VD： SIGN：152
MEAS MODE S/A

HR： 120° 09′ 23″
dHD： -88.652m
VD： 0.225m
MEAS MODE S/A</td></tr>
<tr><td>□Move target(prism) until distance difference is 0 m.</td><td></td><td>HR： 120° 09′ 23″
dHD: 0.000 m
VD： 0.000 m
MEAS MODE S/A</td></tr>
<tr><td colspan="3">（□1）Refer to section 3.8(Way of inputting characters and alphanumeric). Press [ESC]to return to normal mode of distance measurement.</td></tr>
</table>

6. COORDINATE MEASUREMENT

6.1 Execution of Coordinate Measurement

Measure the coordinates by entering the instrument height and prism height, coordinates of unknown Point will be measured directly.

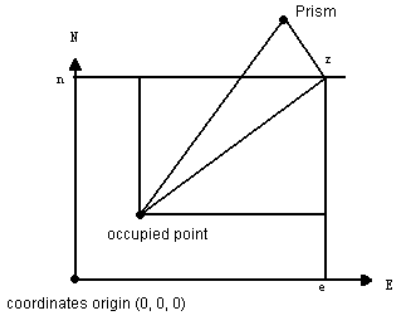
〇When setting coordinate values of occupied point, see Section 6.2“Setting Coordinate Values of Occupied Point”.

〇When setting the instrument height and prism height, see Section 6.3 “Setting Height of the Instrument” and 6.4 “Setting Height of Target (prism Height)”.

〇To set back sight, decide the back sight azimuth, and check the known azimuth, coordinate and distance.

6.2 Setting Coordinate Values of Occupied Point

Set the coordinates of the instrument (occupied point) according to coordinates origin, and the instrument automatically converts and displays the unknown point (prism point) coordinates following the origin.



1）Input coordinate with keyboard.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press（COORDINATE）to enter into the mode of coordinate measurement.		N：0.000m E：0.000m Z：0.000m MEAS SET S/A
□Press[F2]	[F2]	SELECT FILE FILE： ---- LIST SKP ENTER
□Press[F3]（SKP） to enter into setting screen.	[F3]	SET F1：STATION SETUP F2：BACKSIGHT F3：R.HT

□Press[F1] to enter into setting of instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
□Press[F1]. Refer to 3.8,input instrument height. Skip this step if it needn't to input instrument height)	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER
□Press[F4]（ENTER） **C/0523 means that there are 523 coordinate data in DAD.** **M/0599 means that there are 599 Raw coordinate data in DAD.**	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ
□Press[F4]（COORDINATE）	[F4]	N：* 0.000m E： 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F1]（INPUT）to enter into mode of inputting coordinate N. Refer to 3.8. Input coordinate N. The cursor moves to E automatically. Input coordinate E and Z. （Press [▲] or [▼]to select coordinate you wanted by cursor）	[F1] [▲] [▼]	N：=| m E： 0.000m Z： 0.000m DEL ---- 123 ENTER N： 5322.332m E：* 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIGHT F3：R.HT

Range of inputting coordinate:： -999999.999m≤ N、 E ≤+999999.999m -9999.999m≤ Z ≤+9999.999m -999999.999ft≤ N、 E ≤+999999.999ft -9999.999ft≤ Z ≤+9999.999ft		

2）Setting up stating measurement by using coordinate file in the memory.（It shows angle measurement）

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press（COORDINATE）to enter into mode of coordinate measurement.		N： 0.000m E： 0.000m Z： 0.000m MEAS SET S/A
□Press[F2]	[F2]	SELECT FILE FILE： ---- LIST SKP ENTER
□Press[F2]（LIST）several times to select file name of coordinate. Press[F4]（ENTER）to enter into the mode of setting screen.	[F3] [F4]	SELECT FILE FILE： DAD[USED] ---- LIST SKP ENTER SET F1：STATION SETUP F2：BACKSIGHT F3：R.HT
□Press[F1]to enter into the screen of inputting instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER

□Press[F1]. Refer to 3..Input instrument height. （Skip this step, if it needn't to input the instrument height）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER
□Press[F4]（ENTER） **C/0523 means that there are 523 coordinate data in DAD.** **M/0599 means that there is 599 Raw coordinate data in DAD.**	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ
□Press[F1]（SEARCH）to enter into the screen of SEARCH COORD.DATA.	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEACH
□Press[F3]to enter into INPUT PtID SEARCH Press[F1]to input PtID	[F3] [F1]	INPUT PtID SEARCH PtID： INPUT ---- ---- SET INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
□Press[F4](ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

6.3 Setting up Height of Prism

It saves the prism height after powering off.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press (COORDINATE) to enter into the mode of measurement.		N： 0.000m E： 0.000m Z： 0.000m MEAS SET S/A
□Press[F2]（SET）	[F2]	SELECT FILE FILE： ---- LIST SKP ENTER
□Press [F3]（SKP）to enter into the mode of setting screen.	[F3]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
□Press[F3]to enter into the screen of inputting prism height.	[F3]	REFLECTOR HEIGHT INPUT R.HT： 0.000m INPUT ---- ---- ENTER
□Press[F1]to input prism height and press enter.	[F1] [F4]	REFLECTOR HEIGHT INPUT R.HT =10.000| m DEL ---- 123 ENTER REFLECTOR HIGHT INPUT R.HT： 10.000m INPUT ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

6.4 Setting up Back sight

The back sight setting is similar between data collection and S.O. and Coordinate. There are 3 ways to set backsight.

1. Input coordinate data (NE）
2. Use coordinate data in the memory.
3. Input azimuth angle.

1） Set back sight by inputting coordinate data

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press（COORDINATE）to enter into the mode of coordinate measurement.		N：　0.000m E：　0.000m Z：　0.000m MEAS　SET　S/A　SENT
□Press[F2]（SET）	[F2]	SELECT FILE FILE： ----　LIST　SKP　ENTER
□Press[F3]（SKP）to enter into screen of setting.	[F3]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
□Press[F2]to enter into setting of backsight.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523　M/0599 SRCH　----　HSET
□Press[F4]	[F4]	N：*　0.000m E：　0.000m INPUT　----　----　ENTER
□Press[F1]	[F1]	N：=|　m E：　0.000m DEL　----　123　ENTER
□Refer to 3.8.Input coordinate N：、E：in turn.		N：　55.236m E：*　10.000m DEL　----　123
□Press[F4]（ENTER） HR:azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET　----　----　EXIT
		AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET　----　----　ENTER

□Press[F1]（SET）to make HR is as same as hr.	[F1]	
□Press[F4]（ENTER） to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

2） Set back sight by using coordinate data in the memory.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press（COORDINATE） to enter into the mode of coordinate measurement.		N： 0.000m E： 0.000m Z： 0.000m MEAS SET S/A SENT
□Press[F2]（SET）	[F2]	SELECT FILE FILE： ---- LIST SKP ENTER
□Press[F3]（SKP） to enter into setting screen.	[F3]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
□Press[F2]to enter into backsight setting.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F1]to enter into screen of searching coordinate data.	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEACH
□Press[F3]to enter into INPUT PtID SEARCH. Press[F1] to input PtID.	[F3]	INPUT PtID SEARCH PtID： INPUT ---- ---- SET INPUT PtID SEARCH PtID：D1 INPUT ---- ---- SET

	[F1]	
□Press[F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET）to enter into the screen of azimuth angle setting. HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press[F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

3）Set backsight by inputting azimuth angle.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press ▱（COORDINATE）to enter into the mode of coordinate measurement.	▱	N： 0.000m E： 0.000m Z： 0.000m MEAS SET S/A
□Press[F2]（SET）	[F2]	SELECT FILE FILE： ---- LIST SKP ENTER
	[F3]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

□Press[F3]（SKP）to enter into setting screen.		
□Press[F2]to enter into backsight setting.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F3]to enter into horizontal angle setting. Input azimuth angle you wanted.	[F3]	H ANGLE SET（DEG） HR： =| H ANGLE SET（DEG） HR： =123.5540|
□Press[F4]（ENTER）to enter into the screen of azimuth angle setting. HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press[F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
●It shows E-29when in the mode of calculating of azimuth： 1.It can't get azimuth angle if inputting wrong coordinate of station point and back sight point. 2.It can't get azimuth angle if the distance of station point and back sight point is within 2mm.		

6.5 Coordinate Measurement

Coordinate Measurement:

Note：Set station coordinate, station height, prism height and azimuth angle of backsight.

Coordinate of unknown point was calculated and shows by the formula below:

Station coordinate：（N0，E0，Z0）

Coordinate of prism center which compared to instrument center：（n，e，z）

Instrument Height：IH

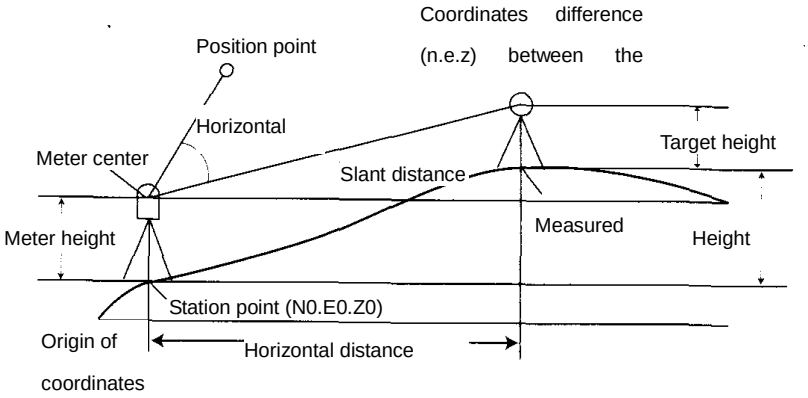
Coordinate of unknown point：（N1，E1，Z1）

Prism height：PH

VD：Z（VD）

N1=N0+n
E1=E0+e
Z1=Z0+IH+Z-PH

Coordinate of instrument center（（N0，E0，Z0+IH）



Operation Procedure	Operation	Display
□Press[ESC]after setting station point, backsight and prism height. Enter into screen of coordinate measurement, page 1.（Or	[ESC]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT N：　0.000m E：　0.000m Z：　0.000m MEAS　SET　S/A　SENT

press to enter into it in the mode of angle measurement.）		
□Aim at prism center. Press[F1]（MEAS）to start measuring and show the result.	[F1]	N： 10.000m E： 5.000m Z： 123.000m MEAS SET S/A SENT

●Mode of coordinate measurement is decided by the mode of distance measurement.
●Setting way of temperature, pressure and prism constant is as same as way of mode of distance measurement.
●It shows coordinate value caculated last time when you enter into the mode of coordinate measurement again.
●Press[F4]（SEND）to transfer present measuring value to computer orPC by RS232.

7. Data Collection

7.1 Preparation

DTM Series can save measuring data in the memory.

It includes file of measuring data and coordinate data in the memory.

Measuring data：Collected data（station, backsight, etc）to save it in the file of measuring data.

Coordinate data：It only saves collected points to file of measuring data.

Number of station point：（In the precondition of the mode of S.O. Unused）It can reach 15000points maximum. The memory includes mode of data collection and S.O., so that number of station stored decreases when you use the mode of S.O.

1） Check the instrument was in the mode of angle measurement or main menu screen, which can assure stored data was not lost.
2) It suggests that recharge the battery and prepare the spare battery with full battery.

DTM Series includes file of measuring data and coordinate data. Hence, select one saving way before data collection.

Example：Saving way: File of Coordinate data and Measuring data（two files are saved at the same time)

Make sure the mode is Angle measurement

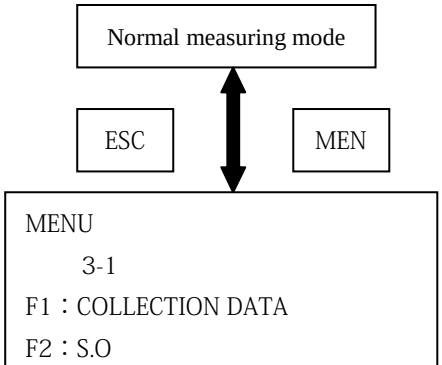
Operation Procedure	Operation	Display
□Press[MENU]to enter into the screen of main menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O

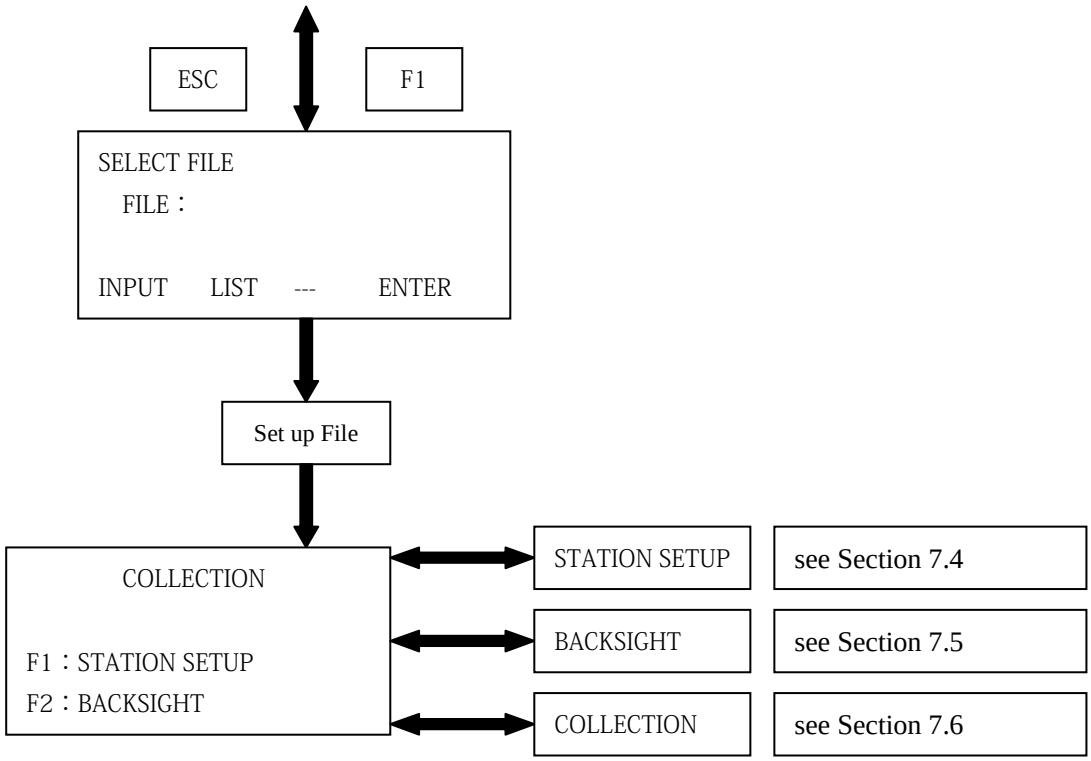
□Press[F4]（P）to enter into menu 3-2	[F4]	MENU 3-2 F1：PROGRAMS F2：SET
□Press[F2]（Parameter setting）to enter into menu of parameter setting 3-1	[F2]	SET MENU 3-1 F1：POWER AUTO[OFF] F2：CMPS[V↑] F3：TILT[OFF] P↓
□Press[F4]（P）twice to enter into menu of parameter setting 3-3	[F4]	SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P
□Select data saving mode is as coordinate and measuring data by pressing [F1]continuously **Coordinate data：Only saves coordinate data** **Measuring data：Only saves measuring data** **Coordinate and measuring data：Saves both coordinate and measuring data**	[F1]	SET MENU 3-3 F1：DATA STORAGE SET [C.AND M.DATA] F3：SAVE AND EXIT P
□Press[F3]to save and escape.	[F3]	MENU 3-2 F1：PROGRAMS F2：SET

7.2 Operation Steps

1. Select file of data collection and save the data collected to the file.
2. Select file of coordinate data. You can use coordinate data of station and backsight.（Skip this step if it needn't to use coordinate data of known point)
3. Set up station point, which includes instrument height and ID of station.
4. Set up backsight. Confirm azimuth angle after measuring back sight point.
5. Set up prism height of point. Start to collect and save the data.

Operation of data collection：





7.3 Select File of Data Collection

Select a file of data collection. It can save measuring data to data file you selected.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press[MENU]to enter into menu 3-1.	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O
□Press[F1]（COLLECTION DATA）	[F1]	SELECT FILE FILE： INPUT LIST ---- ENTET
□Press[F2] continuously(LIST). Select file name of coordinate. □1）	[F3]	SELECT FILE USED FILE： DAD[USED] INPUT LIST ---- ENTET
Press[F4]（ENTER）to select a file Enter into the screen of data collection.□2）	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT

□1）Press[F1]（INPUT）and then input file name if you want to input file name. □2）It shows “[WORK]”on the right of the file name if the file was selected.		

7.4 Setting up Station Point

1）Setting up station by using coordinate file in the memory.

Select file of data collection.(Refer to 7.3 to select file of data collection)

Operation Procedure	Operation	Display
□Mode of data collection		COLLECTION F1：STATION SETUP F2：BACKSIGHT
□Press[F1]（set coordinate of station point） to enter into the screen of inputting instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
□Press[F1]. Refer to 3.8. Input instrument height. （Skip this step if it needn't to input instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER
□Press[F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ
□Press[F1]（SEARCH）to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
		INPUT PtID SEARCH PtID： INPUT ENTER

□Press[F3] to the screen of INPUT PtID SEARCH Press[F1] to input PtID.	[F3] [F1]	
□Press[F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET） to escape.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

2）Input station coordinate.

Select file of data collection.（Refer to 7.3 to select file of data collection）

Operation Procedure	Operation	Display
□Go to the mode of data collection		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
□Press[F1]（set coordinate of station point） to enter into the screen of inputting instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
□Press[F1]. Refer to 3.8. Input instrument height. （Skip this step if it needn't to input instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER
□Press[F4]（ENTER）	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ

C/0523 means there are coordinate data(523) in DAD **M/0599 means there are Raw coordinate data(599) in DAD**		
□Press[F4]（COORDINATE）	[F4]	N：* 0.000m E： 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F1]（INPUT）to enter into mode of inputting coordinate N. Refer to 3.8to input coordinate N. The cursor moves to E automatically and input coordinate E and Z in turn.（Press[▲] or [▼]to move cursor to select coordinate you wanted.	[F1] [▲] [▼]	N：=| m E： 0.000m Z： 0.000m DEL ---- 123 N： 5322.332m E：* 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

7.5 Setting up Backsight

1）Set up backsight by inputting coordinate data.

Select the file of coordinate data(Refer to 7.3to select file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of data collection		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
□Press[F2] to enter into the screen of backsight.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F4]	[F4]	N：* 0.000m E： 0.000m INPUT ---- ---- ENTER

□Press[F1]	[F1]	N：=| m E： 0.000m DEL ---- 123
□Refer to 3.8to input coordinate N：、E：		N： 55.236m E：* 10.000m DEL ---- 123
□Press[F4]（ENTER） HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press[F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

2）Set backsight by using coordinate data in the memory.

Select file of data collection.（Refer to 7.3 to select file of data collection）

Operation Procedure	Operation	Display
□Go to the mode of data collection.		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

□Press[F2]to enter into setting backsight.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F1]to enter into SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
□Press[F3]to enter into INPUT PtID SEARCH Press[F1] and input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID： INPUT ---- ---- ENTER INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
□Press[F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET）to AZIMUTH ANGLE SET HR :azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press[F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to exit.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

3）Setting up back sight by inputting azimuth angle.

Select file of data collection（Refer to 7.3 to select file of data collection）

Operation Procedure	Operation	Display
□Go to the mode of data collection		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
□Press[F2]to enter into the screen of setting back sight.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F3] to enter into the mode of horizontal angle setting. Input azimuth angle you want to input.	[F3]	H ANGLE SET （DEG） HR： =| DEL --- 123 ENTER H ANGLE SET （DEG） HR： =123.5540|
□Press[F4]（ENTER）to enter into the screen of azimuth angle setting. HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press[F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

●It shows E-29when in the mode of calculating of azimuth：

1.It can't get azimuth angle if inputting wrong coordinate of station point and back sight point.
2.It can't get azimuth angle if the distance of station point and back sight point is within 2mm.

7.6 Data Collection

Set instrument in the mode of data collection.

Operation Procedure	Operation	Display
□Set instrument in the mode of data collection.		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
□Press[F3]（COLLECTION）	[F3]	PtID：* ID： R.HT： -0.001m INPUT SRCH MEAS
□Press[F1]（INPUT）to input PtID D1、ID and prism height in turn.	[F1]	PtID：* ID： R.HT： -0.001m INPUT SRCH MEAS
□Press[F3]（MEAS）.□1）	[F3]	N： 10.000m E： 80.000m Z： 0.000m REPMEAAS ---- ---- RECORD
□Press[F4](RECORD). The instrument record data. Return to screen of next point. PtID will add 1 automatically. □2）	[F4]	PtID：*D2 ID： R.HT： -0.001m INPUT SRCH MEAS

□1）Press[F4]（RECORD）. The instrument collects data and records it. Return to measuring screen of next point. PtID will add 1 automatically. ID and prism height remains the same.

□2）PtID will add 1 automatically if only the last position of PtID you put is alphanumeric characters, or it remains the same.

8. S.O.

There are two functions of S.O.: measured point of S.O .and set new point by using known coordinate data in the memory. Input coordinate with keyboard if coordinate data was not saved to the memory. Coordinate data can be input to the memory of the instrument by PC.

Numbers of coordinate data can reach15000 points (We don't use the memory for the mode of data collection).

The memory includes mode of data collection and S.O. so that the memory for coordinate data saved will decrease when you use the mode of data collection.

1) Check the instrument was in the mode of angle measurement or in main menu screen when you power off which can assure that input or out is finishing, in case it would lost the data you saved.
2) In precondition of save, it suggests that recharge the battery and prepare a spare battery with full battery.
3) Considering the memory space you can used when you record new data.

8.1 S.O. Steps

1. Select the file of coordinate data. We can use coordinate data of station, backsight and S.O. point.
2. Set up station point.
3. Set up backsight and get azimuth angle.
4. Input and use coordinate of S.O. point. Start S.O.

8.2 Select File of Coordinate Data

First select a file of coordinate data. Or you may save new measuring data to the file of coordinate data.

You can select present file of coordinate data, create new file in this mode.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
□Press[MENU]to enter into menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O
□Press[F2]（S.O.）to select file menu.	[F2]	SELECT FILE FILE： INPUT LIST ---- ENTER

□Press[F2]（LIST）to select a file as present work file.	[F2]	SELECT FILE FILE：DAD INPUT LIST ---- ENTER
□Press[F4]（ENTER）to enter into S.O. 2-1	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

8.3 Setting up Station Point

1）Input coordinate with keyboard.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
□Press[F1]to input instrument height	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
□Press[F1]. Refer to3.8 to input instrument height. （Skip this step if you needn't to input the instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER

□Press[F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ
□Press[F4]（COORDINATE）	[F4]	N：* 0.000m E： 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F1]（INPUT）to enter into mode of inputting coordinate N. Refer to 3.8 to input coordinate N. The cursor moves to E automatically and input coordinate E and Z in turn.（Press[▲] or [▼]to move cursor to select coordinate you wanted.	[F1] [▲] [▼]	N：=| m E： 0.000m Z： 0.000m DEL ---- 123 ENTER N： 5322.332m E：* 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

2）Use coordinate setting in the memory.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

□Press[F1]to enter into the screen of instrument height setting.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
□Press[F1]. Refer to 3.8to input instrument height. （Skip this step if you needn't input instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER
□Press[F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ
□Press [F1]（SEARCH） to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
□Press[F3]to enter into the screen of INPUT PtID SEARCH Press[F1] to input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID： INPUT ---- ---- ENTER INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
□Press[F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET

□Press[F4]（SET） to escape.	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

8.4 Setting up Backsight Point

1）Set backsight point by inputting coordinate data.

Select file of coordinate data（Refer to 8.2 to select file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
□Press[F2]to set back sight point.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F4]	[F4]	N：* 0.000m E： 0.000m INPUT ---- ---- ENTER
□Press[F1]	[F1]	N：=| m E： 0.000m DEL ---- 123 ENTER
□Refer to 3.8. Input coordinate N：、E：in turn.		N： 55.236m E：* 10.000m DEL ---- 123 ENTER
□Press[F4]（ENTER） HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT

□Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER） to escape.	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

2）Set back sight point by using coordinate data in the memory.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
□Press[F2] to the screen of backsight point setting.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F1]to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
□Press[F3] to enter into the screen of INPUT PtID SEARCH	[F3]	INPUT PtID SEARCH PtID： INPUT ---- ---- ENTER
Press[F1] to input PtID.	[F1]	INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER

□Press[F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET） to enter into the screen of AZIMUTH ANGLE SET HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

2） Set backsight point by inputting azimuth angle.

Select the file of coordinate data（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
□Press[F2] to the screen of backsight point setting	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET
□Press[F3] to enter into the screen of	[F3]	H ANGLE SET （DEG） HR： =| DEL ---- 123 ENTER

horizontal angle. Input azimuth angle you wanted.		
□Press[F4]（SET） to enter into the screen of AZIMUTH ANGLE SET HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：157° 33′ 48″ SET ---- ---- EXIT
□Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ：57° 13′ 48″ >hr ：57° 13′ 48″ SET ---- ---- ENTER
□Press[F4]（ENTER）to escape.	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
●It shows E-29when in the mode of calculating of azimuth： 1.It can't get azimuth angle if inputting wrong coordinate of station point and back sight point. 2.It can't get azimuth angle if the distance of station point and back sight point is within 2mm.		

8.5 S.O.

There are two ways of S.O.

1. Use the coordinate in the memory by using the PtID.
2. Input coordinate directly.

Example：Use the coordinate in the memory.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data.）

Operation Procedure	Operation	Display

□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
□Press[F3] to enter into the screen of S.O COORD SET	[F3]	S.O COORD SET USED FILE：DAD C/0523 M/0556 SRCH ---- ---- NEZ
□Press[F1] to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
□Press[F3] to the screen of INPUT PtID SEARCH Press[F1]to input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID： INPUT ---- ---- ENTER INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
□Press[F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET）to input the screen of prism height. Press[F1]. Refer to 3.8 to input prism height. （Skip this step if you needn't to input prism height）	[F4] [F1]	REFLECTOR HEIGH INPUT R.HT： -0.001m INPUT ---- ---- ENTER REFLECTOR HEIGHT INPUT R.HT：| m DEL ---- 123 REFLECTOR HEIGHT INPUT R.HT：22.000 m INPUT ---- ---- ENTER

□Press[F4]（ENTER） to enter into the screen of S.O. count **HR: Azimuth angle by calculating** **HD: Horizontal distance from S.O. point to instrument**	[F4]	S.O COUNT HR ：57° 13′ 48″ HD： 12.003m ANGLE DIST ---- ----
□ Press[F1]（ANGLE） **HR ：true horizontal angle** **dHR：Horizontal angle of rotating the instrument(aim at the S.O.point) = Measured horizontal angle-calculated horizontal angle；** Rotate the instrument, stop rotating when you see **dHR=0°00□00□**,which means that the direction is correct. Press [F1]（DIST）to show the value of dHD、dZ and dHR within the accepted difference, which means S.O finishing **HD ：Measured horizontal distance** **dHD：Horizontal distance(you move prism to S.O. point)=measured horizontal distance**	[F1] [F1]	S.O PtID：D1 HR ：57° 13′ 48″ dHR： 157° 13′ 48″ DIST ---- NEZ ---- HD： 12.003m dHD： 2.003m dZ： 1.003m MEAS ANGLE NEZ

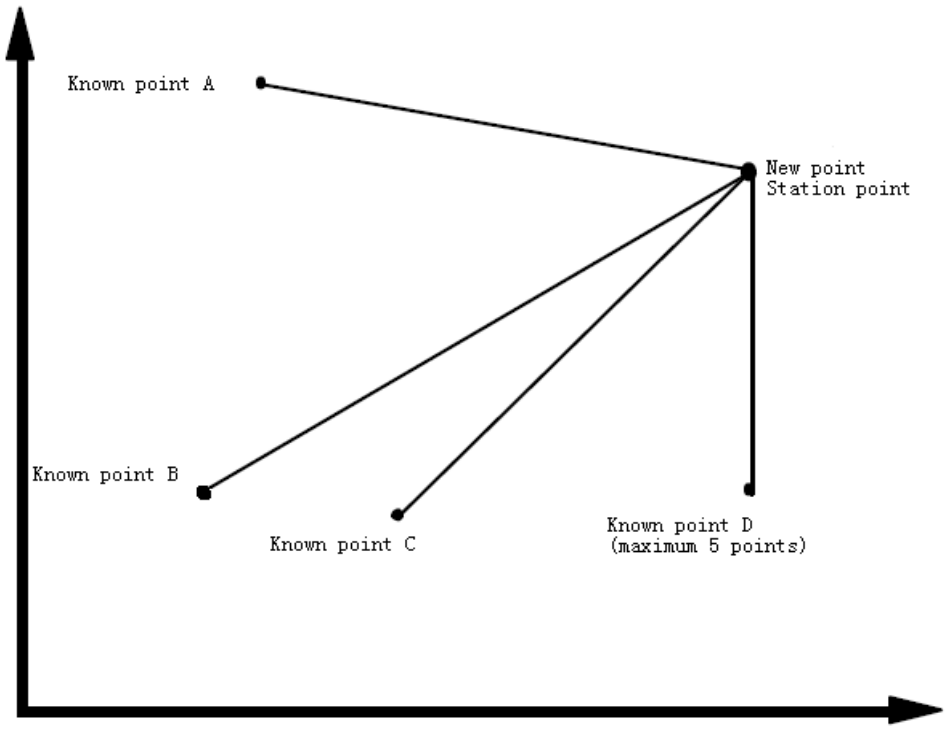
dZ ：VD(from the prism to S.O. point=measured VD-calculated VD		
□Press[F2]（ANGLE）to return to step □ Press[F3] （ NEZ ） to display coordinate. Press[F4]（NEXT）to enter into setting of next .O. Point.（Repeat these steps）.	[F2] [F3] [F4]	S.O COUNT HR ：57° 13′ 48″ HD： 12.003m ANGLE DIST ---- ---- N： 12.003m E： 2.003m Z： 1.003m MEAS ANGLE NEZ S.O COORD SET USED FILE：DAD C/0523 M/0556 SRCH ---- ---- NEZ

8.6 Resection

Set up the instrument at a new point, and calculate the coordinate of the new point using the coordinate data for maximum five known points and the measurement made to these points. By following observation, resection is possible.

Resection by distance measurement: 2 or more points must be measured.

An occupied point coordinate value will be calculated by the method of least squares.



Select file of coordinate data（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
□Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
Press[F4] to enter into the screen of S.O. 2-2	[F4]	S.O 2-2 F1：RESECTION P↓
Press[F1] to enter into the screen of new point setting.	[F1]	NEW POINT PtID： INPUT SRCH SKP
□Press[F1]（INPUT）to input new PtID. Press [F4]（ENTER）.□1）	[F1] Input PtID [F4]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
		NO1# PtID：D1

□Press[F1]（INPUT）to input instrument height. Press[F4]（ENTER）.□2）	[F1] Input instrument height [F4]	
□Press[F1]（INPUT）to input the PtID of Known point A. Press[F4]（ENTER）. Press[F4]（SET） Press[F1]（INPUT）to input prism height . Press[F4]（ENTER）	[F1] Input PtID [F4] [F4] [F1] Input prism height [F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET REFLECTOR HEIGHT INPUT R.HT： -0.001m INPUT ---- ---- ENTER REFLECTOR HEIGHT INPUT R.HT： 10.001m ＞Sight？ DIST
□Aim at known point A. Press[F4]（DIST)	Aim [F4]	HR ：57° 13′ 48″ HD： m VD： SIGN：000 Measuring……
□Go to input Known point B.		N02# PtID：D2 INPUT SRCH NEZ ENTER
□Follow step to measure known point B. Get value of Residval error after measuring 2 known points by pressing [F4] □3）	Aim [F4] [F1]	Residval error dHD= 0.002m dZ = 0.000m NEXT ---- ---- CALC N03# PtID：D3 INPUT SRCH NEZ ENTER HR ：57° 13′ 48″ HD： m

Press[F1]（NEXT）to measure other known points, maximum 5 points. Fellow steps □、□ to measure known point C Show measuring value.		
□Press[F4]（CALC）to show standard deviation Press[F2]（↓）to standard deviation Press[F2]（↓） or（↑）can show standard deviation above mentioned in turn	[F4] [F2]	Standard Deviation =0.000sec ---- ↓ ---- NEZ SD（n）=0.362m SD（e）=0.001m SD（z）=0.000m ↑ NEZ
□Press[F4]（COORDINATE）to show the coordinate of new point.	[F4]	N： 1.000m E： 0.000m Z： 0.000m RECORD ? YES
□Press[F3]（YES）to save the coordinate of new point to file of coordinate data. Set the coordinate of new point as the coordinate of station point. Escapee. □4）	[F3]	S.O 2-2 F1：RESECTION P↓
□1）Press [F3]（SKP）if you don't want to save data of new point.		

□2）Press[F3]（COORDINATE）if you want to input known coordinate.

□3）Residual error

dHD（horizontal distance between two known points） =measuring value-calculated value；

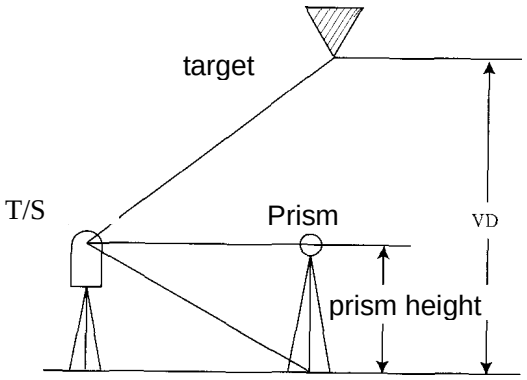
dZ=（Get coordinate Z of new point on the base of known point A）-（Get coordinate Z of new point on the base of known point B）

□4）The value of new point can't be saved to the file of coordinate data if you press [F3]（SKP）on the step 2. It only set coordinate of station point instead of the value of new point.

9. Application Program

9.1 REM

In order to measure the height of the target where the prism could not be placed, you can put the prism at any position on the vertical line on which the target is located, the remote height can then be measured.



● Input way if you get（h）（Example：h=1.6m）

Operation Procedure	Operation	Display
□Press[MENU] and press[F4]（P↓）to turn to page 2.	[F4]	MENU 3-2 F1：PROGRAMS F2：SET

□Press[F1]to go to program.	[F1]	PROGRAMS F1：REM F2：MLM
□Press[F1]（REM）	[F1]	REM F1：INPUT R.HT F2：NO R.HT
□press[F1]	[F1]	REFLECTOR HEIGHT INPUT R.HT： 0.000 m INPUT --- --- ENTER
□Input prism height（□1）	[F1] Input prism height [F4]	REM HAVE R.HT HD： MEAS --- ---
□Aim at prism and press[F1]（MEAS） It shows horizontal distance from the instrument to prism（HD）	Aim at P [F1]	REM HAVE R.HT HD： SIGN：112 MEAS --- --- REM HAVE R.HT HD* 123.342 m MEAS --- ---
□Press[F4]（SET）after finishing measurement. Get the position of prism（□2）	[F4]	REM HAVE R.HT VD： 1.600 m --- R.HT --- HD
□Aim at target K. It shows vertical distance（VD）（□3）	Aim at K	REM HAVE R.HT VD： 24.287 m --- R.HT --- HD

(□1)Refer to 3.8“Input way of alphanumeric characters”

(□2)Press[F2]（Prism height）to return to step □.Press[F3]（HD）to return to step □.

(□3)Press[ESC]to return to menu.

● The input way for no prism height.

Operation Procedure	Operation	Display
□Press[MENU] and press[F4]（P↓）to turn to page 2.	[F4]	MENU 3-2 F1：PROGRAMS F2：SET
□Press[F1]to enter to program.	[F1]	PROGRAMS F1：REM F2：MLM
□Press[F1]（REM）	[F1]	REM F1：INPUT R.HT F2：NO R.HT
□Press[F2]	[F2]	REM NO R.HT HD： MEAS --- ---
□Aim at prism and press[F1]（MEAS） It shows horizontal distance from the instrument to prism（HD）	Aim at P [F1]	REM NO R.HT HD： SIGN：112 MEAS --- --- REM NO R.HT HD* 123.342 m MEAS --- ---
□Press[F4]（SET）after finishing measurement. It shows present vertical angle.	[F4]	REM NO R.HT V↑： 90°16′00″ REM NO R.HT VD： 0.000 m

Aim at ground and press[F4]（SET） （Get accurate remote elevation if only you aim at the ground）	Aim at ground [F4]	
□Aim at target K. It shows vertical distance（VD）（□2、□3）	Aim at K	REM NO R.HT VD： 24.287 m --- V: HD ---
(□1)Refer to 3.8“Input way of alphanumeric characters” (□2)Press[F3]（Horizontal distance）to return to step □.Press[F2]（V:）to return to step □. (□3)Press[ESC]to return to menu.		

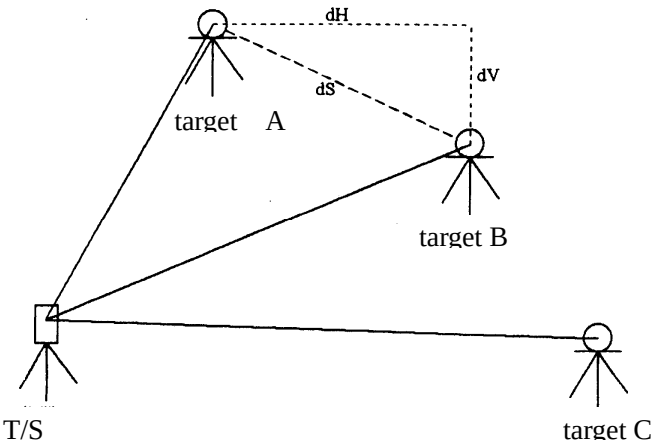
9.2 MLM

Measurement for horizontal distance（dHD）, slope distance(dVD),elevation (dVR) and horizontal bearing (HR)between two target prisms.

There are two functions:

★ MLM-1（A-B、A-C）：measure A-B, A-C, A-D……

★ MLM-2（A-B, B-C）：measure A-B, B-C, C-D……



[例]：1. MLM -1（A-B, A-C）

2. The measuring steps of MLM -2（A-B，B-C）is as same as mode of MLM-1.

Operation Procedure	Operation	Display
□Go to menu of application program.		PROGRAMS F1：REM F2：MLM
□Press[F2] to enter into MLM.	[F2]	MLM F1：MLM -1（A-B，A-C） F2：MLM -2（A-B，B-C）
□Press[F1] to enter into MLM-1.	[F1]	MLM -1（A-B，A-C） STEP-1 HD： MEAS ---- ---- SET
□Aim at prism A. Press[F1]（MEAS）to show HD from instrument to Point A	Aim at A [F1]	MLM -1（A-B，A-C） STEP-1 HD： 102.365m MEAS ---- ---- SET
□Press[F4]（SET）	[F2]	MLM -1（A-B，A-C） STEP-2 HD： MEAS ---- ---- SET
□Aim at prism B. Press[F1]（MEAS）to show HD from instrument to Point B.	Aim at B [F1]	MLM-1（A-B，A-C） STEP-2 HD： 108.665m MEAS ---- ---- SET
□Press[F4]（SET）to show dSD between A and B. It also shows HR from A、B and the instrument.	[F4]	MLM -1（A-B，A-C） HR： 122° 09′ 30″ dSD： 42.586 m

□Press to show dHD and dVD between A and B Press one time to return to the screen of step□		MLM -1（A-B，A-C） dHD： 2.586 m dVD： 40.586 m
□Press[F3]（HD）to enter into MLM-1step 2（start to measure C、D……Steps is as same as step□～□）	[F3]	MLM -1（A-B，A-C） STEP-2 HD： MEAS ---- ---- SET

9.3 Area Measurement

This mode calculates the area of a closed figure.

There are two area calculation methods as follows:

1） Area calculation from Coordinate data file

2） Area calculation from Measured data

Note：

Area is not calculated correctly if enclosed lines cross each other.

It is impossible to calculate what a mix of coordinate file data and measured data.

The number of points used to calculate are not limited.

The area to be calculated shall not exceed 200000 sq.m or 2000000 square feet.

1） 1.Area calculation from Coordinate data file

Operation Procedure	Operation	Display
□Go to menu of application program.		PROGRAMS F1：REM F2：MLM
□Press[F3]to enter into Area measurement.	[F3]	AREA F1：FILE DATA F2：MEASUREMENT
□Press[F1]（FILE）	[F1]	SELECT FILE FILE： ---- LIST ---- ENTER

□Press [F2]（LIST）continuously. Select file name. Press[F4]（ENTER）.	[F2] [F4]	AREA FILE：DAD 0000 m.sq NEXT：D1 SRCH ---- UNIT NEXT
□Press[F1](SEARCH) to enter into coordinate data. Input PtID D1 and find the data you needed.	[F1] [F3]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
□Press[F4]（SET）.	[F4]	AREA FILE：DAD 0001 m.sq NEXT：D2 SRCH ---- UNIT NEXT
□Repeat step□ ～ □ to select 3 coordinates at least（Press[F4]（NEXT）to select if the coordinate data is continuing）It shows the area of graph which makes by the points you selected		AREA FILE：DAD 0003 56.522 m.sq NEXT：D4 SRCH ---- UNIT NEXT
□Press[F3]（UNIT） Press[F1]to select m.sq (square meter)as unit. Press[F2]to select ha (hectare)as unit. Press[F3]to select ft.sq (square feet)as unit Press[F4]to select acre as unit.	[F3] [F1] [F2] [F3] [F4]	AREA FILE：DAD 0003 m.sq
●Press[ESC] to escape.		

2. Area calculation from Measured data

Operation Procedure	Operation	Display
□Go to menu of application program.		PROGRAMS F1：REM F2：MLM
□Press[F3]to enter into Area measurement.	[F3]	AREA F1：FILE DATA F2：MEASUREMENT
□Press[F2]（MEASUREMENT）	[F2]	AREA 0000 m.sq
□Aim at the first target point, Press[F1]（MEAS）. The instrument shows calculated coordinate of the point（This coordinate is the coordinate used to calculating. It is not related to true coordinate.）.It measures next point after 2 seconds.	[F1]	AREA 0001 m.sq
□Repeat step□ to show the area of the graph which makes by 3 points at least.		AREA 0003 56.522 m.sq
□Press[F3]（UNIT） Press[F1]to select m.sq (square meter)as unit. Press[F2]to select ha (hectare)as unit. Press[F3]to select ft.sq (square feet)as unit Press[F4]to select acre as unit.	[F3] [F1] [F2] [F3] [F4]	AREA 0003 m.sq
●Press[ESC] to escape.		

10. Memory Management

You can use any data in the memory of the instrument in the mode of memory management.：

It explains as follows according to these items:

1.File Management and Search Data:：edit file name、delete file、search and browse PtID and data、search the quantity of stored data

2.Input coordinate point：create file name、save coordinate data to the file of coordinate data

3.Delete coordinate：delete coordinate data in the file of coordinate data

4.Data communication：send、receive measuring data and coordinate data

5.Initialize memory：clear memory

10.1 Enter into Mode of Memory Management

Go to the mode of angle measurement

Operation Procedure	Operation	Display
□Press[MENU] to enter into the screen of menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O
□Press[F3]to enter into the screen of memory management 2-1	[F3]	MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F4]to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION

10.2 File Management & Search Data

Go to the mode of memory management

Operation Procedure	Operation	Display
□Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F1]		FILE NUMBER：8 NAME：DAD [USED] C/0956 M/0956

File No.：there are 8 files in the memory **File name：The present file name is DAD** **C/0956：There are 956 coordinates in the file** **M/0956 :There are 956 measured data in the file**	[F1]	
□Press[F1]（EDIT）to change present file name Example：Change to DAD1 （Refer to 3.8）	[F1]	FILE NUMBER：8 NAME= [USED] C/0956 M/0956 FILE NUMBER：8 NAME：DAD1 [USED] C/0956 M/0956
□Press[F2]（LIST）to search the quantity of coordinates and measured data in the present file name. （Press[F2] continuously）	[F2]	FILE NUMBER：8 NAME：DAD2 C/0956 M/0956
□Press[F4]（DEL） **Press[F1]to delete coordinate data in DAD2** **Press[F2]to delete measured data in DAD2** **Press[F3]to delete coordinate data and measured data in DAD2** Take delete all data as an example Press[F3] Press[F1]	[F4] [F3] [F1]	DELETE FILE：DAD2 F1：COORD.DATA F2：MEAS.DATA F3：ALL DATA DELETE FILE：DAD2 DELETE THIS FILE AND ALL DATA YES ---- ---- NO FILE NUMBER：7 NAME：DAD3 C/0956

□Press[F3]（SEARCH）to enter into the screen of SEARCH DATA （Take search data as an example）		SEARCH DATA F1：COORD.DATA F2：MEAS.DATA C/0956
□Press[F2] to enter into the screen of SEARCH COORD. DATA	[F2]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
□Press[F3]to enter into the screen of INPUT PtID SEARCH Press[F1]to input PtID	[F3] [F1]	IUPUT PtID SEARCH PtID： INPUT ---- ---- ENTER IUPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
□Press[F4]（ENTER）.□1）□2） Press[F4]（P↓） Press[F4]（P↓）	[F4] [F4] [F4] [F4]	PtID： D1 4-1 ID：111 R.HT： -0.001m EDIT ---- ---- P↓ V↑： 122°09′30″ 4-2 HR ： 90°09′30″ INS.H： 10.000m ---- ---- ---- P↓ SD： 10.000m 4-3 VD： 1.000m HD： 9.000m ---- ---- ---- P↓ N： 10.000m 4-4 E： 80.000m Z： 0.000m ---- ---- ---- P↓

Press[F4]（P↓）		
□1）Press[F1]（EDIT）to change PtID and ID. □2）Press[▲][▼]to search coordinate data of previous point and next point. ● Press[ESC] to escape.		

10.3 Input Coordinate Point & Create File

Example：Create file and input coordinate

Go to the mode of memory management

Operation Procedure	Operation	Display
□Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F3]（INPUT COORD）	[F3]	SELECT FILE FILE： INPUT LIST ---- ENTER
□Press[F1]（CREATE）to input file name DA1（Refer to3.8）□1）	[F2] Input DA1	SELECT FILE FILE：= | DEL ---- 123 SELECT FILE FILE：DA1 INPUT LIST ---- ENTER
□Press[F4]（ENTER）to enter into the screen of inputting coordinate data.□2）	[F4]	INPUT PtID：* ID： INPUT ---- ---- ENTER

□Press[F1]（INPUT）to input PtID D1（Refer to 3.8）The cursor moves to next line after finishing it.	[F1]	INPUT PtID：D1 ID：* INPUT ---- ---- ENTER
□Press[F1]（INPUT）to input ID 111（Refer to 3.8）	[F1]	INPUT PtID：D1 ID：111 INPUT ---- ---- ENTER
□Press[F4]（ENTER）	[F4]	N：* 0.000m E： 0.000m Z： 0.000m INPUT ---- ---- ENTER
□Press[F1]（INPUT）.Input the value of N、E、Z（Refer to3.8）	[F1]	N：* 10.000m E： 50.000m Z： 20.000m INPUT ---- ---- ENTER
□Press[F4]（ENTER） to turn to the screen of next point.	[F4]	INPUT PtID：D1 ID：111 INPUT ---- ---- ENTER
□Press [ESC]to escape。	[ESC]	MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□1）Press[F2]（LIST）to select a filed existed as stored file of coordinate data. □2）Press[▲][▼]to move the cursor.		

10.4 Delete Coordinate Point

Go to the mode of memory management

Operation Procedure	Operation	Display
□Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION
□Press[F1]（DELETE COORD. DATA）	[F1]	SELECT FILE FILE： INPUT LIST ---- ENTER
□Press[F2]（LIST）to select the file in which you want to delete the point （Take D1 in DA1as an example)	[F2] Select DA1	SELECT FILE FILE：DA1 INPUT LIST ---- ENTER
□Press[F4]to enter into the screen of SEARCH COORD. DATA.	[F4]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
□Press[F3]to enter into the screen ofINPUT PtID SEARCH Press [F1] to input PtID D1.	[F3] [F1] Input D1	IUPUT PtID SEARCH PtID： INPUT ---- ---- ENTER IUPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
	[F4]	N：* 10.000m E： 50.000m Z： 20.000m PtID：D1 F4：DEL

□Press [F4]（ENTER）		
□Press [F4]（ENTER）	[F4]	DELECT THIS PtID AND COORD.DATA YES ---- ---- NO
□Press[F1]（YES）to return to the screen of SEARCH COORD. DATA after deleting.	[F1]	NOW DELECT PtID… SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
●Press[ESC] to escape.		

10.5 Data Communication

1. Send data（Sending way of coordinate data and measured data is the same. Take send measured data as an example）

Go to the mode of memory management

Operation Procedure	Operation	Display
□Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION
□Press[F2] to enter into the screen of data communication.	[F2]	DATA COMMUNICATION F1：SEND DATA F2：RECEIVE C.DATA

□Press[F1]to enter into the screen of SEND DATA	[F1]	SEND DATA F1：SEND COORD.DATA F2：SEND MEAS.DATA
□Press[F2]	[F2]	SELECT FILE FILE： ---- LIST ---- ENTER
□Press[F2]（LIST）to select the file in which you want to send data （take DA1 as an example）	[F2] Select DA1	SELECT FILE FILE：DA1 ---- LIST ---- ENTER
□Press[F4] to return after finishing it. （Send it again if the screen shows ERROR）	[F4]	SEND COORD.DATA… SEND DATA F1：SEND COORD.DATA F2：SEND MEAS.DATA

2. Receive coordinate data

Go to the mode of memory management

Operation Procedure	Operation	Display
□Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION

□Press[F2] to enter into the screen of data communication.	[F2]	DATA COMMUNICATION F1：SEND DATA F2：RECEIVE C.DATA
□Press[F2]（receive coordinate data）	[F2]	SELECT FILE FILE： ---- LIST ---- ENTER
□Press[F2]（LIST）to select the file for storing data （Take DA1 as an example）	[F2] Select DA1	SELECT FILE FILE：DA1 ---- LIST ---- ENTER
□Press[F4]to return after finishing it.（Receive it again if the wrong screen shows. It means file DA1 is full if the screen shows ERROR2）	[F4]	RECEIVE COORD.DATA … DATA COMMUNICATION F1：SEND DATA F2：RECEIVE C.DATA

10.6 Initializing Memory

Go to the mode of memory management

Operation Procedure	Operation	Display
□Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA
□Press[F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION

□Press[F3]（Initialize memory）	[F3]	DELETE ALL FILE AND DATA! YES ---- ---- NO
□Press[F1]（YES）to return.	[F1]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION
●Press[F4]（NO）to cancel initialize memory. Escape.		

11. Parameter Setting Up

11.1 Enter into Setting up Parameter

Go to the mode of angle measurement

Operation Procedure	Operation	Display
□Press[MENU] to enter into the screen of menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O
□Press[F4]（P）to enter into the screen of menu 3-2	[F4]	MENU 3-2 F1：PROGRAMS F2：SET
□Press[F2]（Parameter Setting）to enter into the screen of parameter setting menu 3-1	[F2]	SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
□Press[F4]（P）to enter into the screen of menu 3-2	[F4]	SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1〞]
□Press[F4]（P↓）to enter into the screen	[F4]	SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓

of menu 3-3		

11.2 Setting up Power off Automatically

Example：Change Power ON to OFF on the mode of power off automatically（Initial setting:[ON]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-1		SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
□Press[F1]to change [ON] to [OFF]	[F1]	SET MENU 3-1 F1：POWER AUTO[OFF] F2：CMPS[V↑：] F3：TILT[ON] P↓

11.3 Setting up Position 0(Vertical Angle)

Example：Change position 0(Vertical angle) [V↑：] to [V→：]（Initial setting: [V↑：]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-1		SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
□Press[F2]to change [V↑：] to [V→：] **V□：Zenith distance** **V□：Height angle**	[F2]	SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS [V→：] F3：TILT[ON] P↓

11.4 Setting up Compensator

Example：Change compensator from[ON] to [OFF]（Initial setting: [ON]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-1		SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
□Press[F3]to change [ON] to [OFF]	[F3]	SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[OFF] P↓

11.5 Setting up Angle Unit

Example：Change angle unit from[Degree] to [MIL]（Initial setting: [MIL]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-2		SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1 ”]
□Press[F1]to change [degree] to [MIL] **One time:[MIL]** **Two times:[GON]**	[F1]	SET MENU 3-2 F1：ANGLE UNIT [MIL] F2：READ[1 ”]

11.6 Setting up Minimum Reading

Example：Change minimum reading from[1”] to [5”]（Initial setting: [1”]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-2		SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1 ”]
□Press[F2]to change [1”]to [5”] **One time:[5”]**	[F2]	SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[5 ”]

Two times:[10”**]** **Three times:[**20”**]**		

11.7 Setting up Distance Unit

Example：Change distance unit from[m]to [ft]（Initial setting: [m]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-2		SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1 ”]
□Press [F3]to change [m]to [ft]	[F3]	SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1 ”]

11.8 Setting up Data Storing

Example：Change data storing from[Coordinate Data]to [Measuring data]（Factory initial setting [Coordinate Data]）

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-3		SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓
Press[F1]to change [Coordinate Data]to[Measuring data] **One time:[Measuring data]** **Two time:[Coordinate and Measuring data]**	[F1]	SET MENU 3-3 F1：DATA STORAGE SET [MEAS.DATA] F3：SAVE AND EXIT P↓

11.9Saving Setup

You must execute these steps after finishing above changes, or all changes are invalid.

Operation Procedure	Operation	Display
□Go to the screen of parameter setting menu 3-3		SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓

□Press[F3]to save setting and escape.	[F1]	MENU 3-2 F1：PROGRAMS F2：SET

11.10 Contrast Adjusting

Operation Procedure	Operation	Display
□Go to the mode of angle measurement.		V↑： 82° 09′ 30″ HR ： 90° 09′ 30″ 0SET HOLD HSET
□Press[□]	[□]	F1：CONTRAST ADJ F2：LCD F3：EXIT
□Press[F1] Press[F1]（+）or [F2]（-） to change contrast adjusting.	[F1] [F1] [F2]	CONTRAST ADJ： [20] [+] [-] ---- ENTER CONTRAST ADJ： [25] [+] [-] ---- ENTER
□Press[F4]（ENTER）		F1：CONTRAST ADJ F2：LCD F3：EXIT
●Press[F3][ESC] to escape.		

12. Compensator(Tilt Sensor)

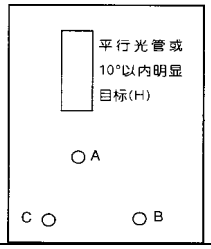
Compensator is a component to measure tilt angle of the instrument and horizontal surface. The compensator can make vertical angle you measured more accurate. So you must check and adjust it regularly.

Level the instrument. To set it as picture shows.

12.1 Enter into Mode of Compensator Adjusting

Operation Procedure	Operation	Display
□Press[F2]to power on until the screen (right side)shows and release [F2]	[F2]+ [POWER]	ADJUSTMENT MODE SENSOR SET TURN TELESCOPE
□Move telescope and make vertical angle passing 0. Enter into the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
●Press[F3]（ESC）. The instrument power on again.		

12.2 Position 0 Check



Operation Procedure	Operation	Display
□Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
□Press[F2]to enter into the screen of CHECK TILTE SENSOR	[F2]	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ---- ---- ---- EXIT
□Aim at target H in the left position to get reading of compensator**,.** We say Y1.	Left position aim at H	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ---- ---- ---- EXIT
□Aim at target H in the right position to		CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：-0° 00′ 20″

get reading of compensator,. We say Y2. If **Y1+Y2 > 30" or Y1+Y2 < -30"** you must adjust compensator because the position 0 of the compensator is over standard value.	Right position aim at H	
□Press[F4]（ESC）to return.	[F4]	ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT

12.3 Position 0 Changing

Fellow these steps if the position 0 of the compensator is over standard value.
Open the right side cover, you may see a sealed component, that is, compensator.

Operation Procedure	Operation	Display
□Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
□Press[F1] to enter into the screen of SET TITLE SENSOR.	[F1]	SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ---- SET ---- EXIT
□Loose the screw of compensator and move the compensator slightly until the compensator reading is near to **0°00□00□（±2"） and then screw it.**		SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 00″ ---- SET ---- EXIT
□Press[F4]（ESC）to escape.	[ESC]	ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
□Repeat 12.2 and 12.3until the position 0 of compensator is reach standard value.		

12.4 Position 0 Adjusting

Operation Procedure	Operation	Display
□Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
□Press[F1] to enter into the screen of SET TITLE SENSOR.	[F1]	SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ---- SET ---- EXIT
□Move foot screw A to make the reading of compensator as **0°00□00□**；Aim at target H in the left position to get the reading of vertical angle. We say M .		SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 00″ ---- SET ---- EXIT
□Move fine motion screw of vertical to make reading of vertical angle is as M+3′。		SET TITLE SENSOR V：82° 12′ 30″ TITLE：-0° 02′ 10″ ---- SET ---- EXIT
□Move foot screw A. Aim at target H. Press [F2]（SET）. The instrument power on again.	[F2]	
□Repeat steps□、□		
□Move fine motion screw of vertical to make reading of vertical angle is as M-3′。		SET TITLE SENSOR V：82° 06′ 30″ TITLE：+0° 02′ 10″ ---- SET ---- EXIT
□Move foot screw A. Aim at target H. Press [F2]（SET）. The instrument power on again.		

12.5 Accuracy Check

Do these steps below if only position 0 of the compensator is standard.

Operation Procedure	Operation	Display
□Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
□Press[F2] to enter into the screen of CHECK TILTE SENSOR	[F2]	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ---- ---- ---- EXIT
□Aim at target H in the left position to make the reading of compensator as **0°00□00□**；aim at target H to get the reading of vertical angle. We say M1 .	Left position Aim at H Footscrew A	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 00″ ---- ---- ---- EXIT
□Move foot screw A to make the reading of compensator as **+0°03□00□** aim at target H to get the reading of vertical angle. We say M2 .	Left position aim at H Footscrew A	CHECK TITLE SENSOR V：82° 12′ 30″ TITLE：+0° 03′ 00″ ---- ---- ---- EXIT
□Move foot screw A to make the reading of compensator as **-0°03□00□** aim at target H to get the reading of vertical angle. We say M3 .	Left position Aim at H Footscrew A	CHECK TITLE SENSOR V：82° 06′ 30″ TITLE：-0° 03′ 00″ ---- ---- ---- EXIT
□If□M2-M1□>3" or□M3-M1□>3"occurs, it means that compensator is out of standard. Repeat **“12.4Position 0 adjusting”**, until □M2-M1□≤3" 、 □M3-M1□≤3"。		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT

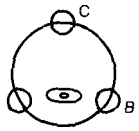
□Press[F4]（ESC） to escape	[F4]	

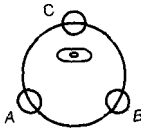
13. Check & Adjustment

13.1 Check & Adjustment of Constant

Instrument constant is addictive constant.

Instrument constant has been checked and adjusted in the factor. It changes seldom and we suggest checking one or two times every year. The check should be made on the base line, also you can set up a base line, 20m. Compare new instrument you purchased with the base line.





Instrument constant checking must avoid these factors: difference of instrument setting and prism, baseline accurate, aim difference, atmospheric correction, atmospheric refraction and earth curvature correction

Compare the result. Fellow these steps to check and adjust if the difference is over 5mm.

□Select one point C in a line AB(about 100m). Observe the length of AC， AB and BC.

□Repeat observation and get instrument constant K：

K = AC + BC - AB

□Set constant again if there is a difference between standard constant and calculated constant.

□Compare the instrument constant on a standard base line.

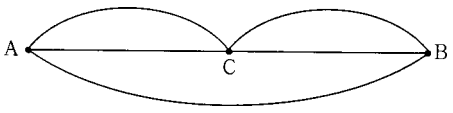
How to set instrument constant, please contact me.

13.2 Check & Adjustment of Plate Vial

Check

□Rotate the instrument horizontally by loosening the Horizontal Clamp Screw and place the plate vial parallel with the line connecting leveling screw A and B, and then bring the bubble to the center of the plate vial by turning the leveling screws A and B.

□Rotate the instrument 180°（200g）around its vertical axis. Observe the bubble of plate vial. Fellow the steps below to adjust it if the bubble is not in the center.



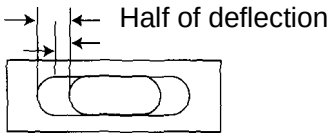
Adjustment

□If the bubble of the plate vial moves from the center, bring it half way back to the center by adjusting the leveling screw, which is parallel to the plate vial. Correct the remaining half by adjusting the screw of plate

vial with adjusting pin.

□Confirm whether the bubble does is in the center by rotating the instrument 180 .If not, repeat step □.

□ Turn the instrument 180°（200g）and adjust the third screw to center the bubble in the vial.



13.3 Check & Adjustment of Circular Vial

Check

No adjustment is necessary if the bubble of the circular vial is in the center after inspection and adjustment of the plate vial.

Adjustment

If the bubble of the circular vial is not in the center, bring the bubble to the center by using the adjusting pin to adjust two bubble-adjusting screws.

Circular Vial Adjustment Screw for Circular vial

13.4 Check & Adjustment of Optical Plummet

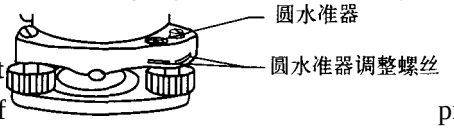
Check

□Set the instrument on the tripod and place a piece of white paper with two perpendicular lines, then intersect drawn on it directly under the instrument. Adjust the leveling screws so that the center mark of the optical plummet coincides with the intersection point of the cross on the paper.

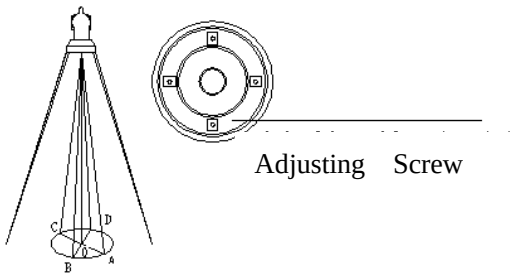
□Rotate the instrument around the vertical axis 180°（200g）observe whether the center mark position coincides with the intersection point of the cross. If the center mark always coincides with intersection point, no adjustment is necessary.

Otherwise, the following adjustment is necessary.

Adjustment



□Take off protective cover of the optical plummet, you may see 4 adjusting screws. Adjust 4 adjusting screw.



□Move woodscrew to make the center of optical plummet coincides with ground point.

□Rotate the instrument around the vertical axis 180°（200g）observe whether the center mark position coincides with the intersection point of the cross. If the center mark always coincides with intersection point, no adjustment is necessary. Otherwise, repeat steps above mentioned.

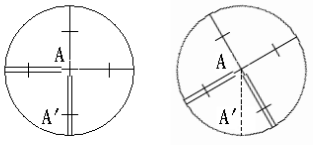
13.5 Check & Adjustment of Inclination of Reticle

Check

□Set the instrument on a tripod and level it.

□Aim at target A with telescope（One point, 50m away）。

□Observe point A moves along the vertical line of the reticle or not by moving telescope up and down.. If so, no adjustment is necessary. If not so, then need to adjust the reticle.

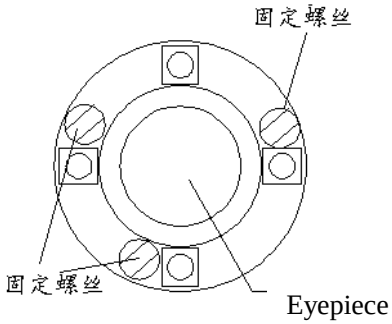


Adjustment

□Remove the eyepiece cover to expose the four reticule adjusting screws.

□Loosen the four reticule adjusting screws uniformly with an adjusting pin. Rotate the reticule around the sight line and align the vertical line of the reticule with point Ａ. Tighten the reticule adjusting screws.

□Repeat the inspection and adjustment to see if the adjustment is correct.



13.6 Check & Adjustment of Perpendicularity of line of sight to Horizontal Axis (c)

Check

□Set the instrument on a tripod and level it.

□Aim at cross line of the reticule of the collimator or a target away. Observe left position and right position.

□Calculate difference after getting horizontal angle reading (left position) HI and(right position)HR

C = （ HI – HR ± 180°）/2

If **C □ 8"**, no adjustment is necessary；If **C > 8"**, fellow these steps to adjust it.

Adjustment

□Rotate fine motion screw in the right position and make the reading is **HR + C**.

□Remove the eyepiece cover to adjust two adjusting screws, which makes reticule coincides with cross line of collimator or one target away.

□Repeat check and adjustment until C ≤ 8".

13.7 Check & Adjustment of Vertical Index Difference (i angle)

Inspect the item after finishing the inspection and adjustment of section 13.5 and 13.6.

Check

□Set the instrument on a tripod and level it.

□Sight object A in left position and read the Vertical angle value VI. Rotate the telescope. Sight object B in right position and read the Vertical angle value VR.

□Calculating, **i=(VI+VR-360°)/2**

□If **i□10"**, no adjustment is necessary. If **i>10"**, to adjust it.

Adjustment

Operation Procedure	Operation	Display
□Keep to press[F1] to power on until right screen occurs. Loose [F1]	[F1]+ [POWER]	ADJUSTMENT MODE V ANGLE 0 SET TURN TELESCOPE
□Rotate telescope and make vertical angle passing 0. Enter into the mode of V ANGLE 0 SET		V 0 POINT SET （SETP-1） V：82° 06′ 30″ ---- ---- ---- SET
□Aim at target(left position). Press[F4]（SET）	Aim at target [F4]	V 0 POINT SET （SETP-1） V：182° 06′ 30″ ---- ---- ---- SET

□Aim at target(right position). Press[F4] （SET）. Power on automatically.	Aim at target [F4]	
□Finish adjustment Repeat, if not within standard.		

13.8 Check of Parallel between Line of Sight and Emitting Photoelectric Axis

This step was done after finishing the inspection and adjustment of Item 13.5 and 13.6.

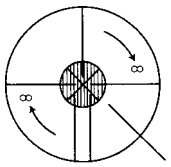
Check

□Set the prism 2m from the instrument.(Power on)

□Sight the center of the prism with reticule.

□Set observe mode as the mode of distance measurement.

□Observe eyepiece and focus to red point(flashing). If the difference between cross line of telescope and red point on the horizontal and vertical direction is within 1/5 of red point diameter, no adjustment is necessary. Otherwise, the instrument needs repairing or contact me.

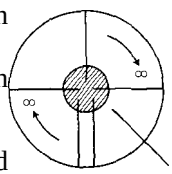


Prism Red light point

14 Technical Index

Telescope

Image	Erect
Magnification	３０×
Effective aperture	48mm
Resolving power	3.75″
Minimum focus	１ｍ
Staid ratio	１００
Sight distance precision	≤0.4％D
Tube length	172mm



Angle Measurement

Measuring method Photoelectric detection by incremental encoder

Diameter of circle (vertical, horizontal) 79ｍｍ

Minimum reading	1″、5″、10″Selectable
Measuring unit	360° ／400gon／6400mil Selectable
Vertical angle 0°	Zenith 0° ／Horizontal 0° Selectable
Accuracy	2″

Distance Measurement

Single prism (under fair weather condition)

DTM102N ： 1.0km

DTM102NL： 1.8km

Triple prism (under fair weather condition)

Display	Max：999999.999m Min：1mm
Unit	m／ft Selectable
Accuracy	±(3mm+2ppm・D)
Measuring time	Fine single shot: 3S Tracking: 0.8 S
Meteorological Correction	Manual input, Auto correction
Reflection prism correction	Manual input, Auto correction

Vial

Plate vial	20″/2mm
Circular vial	8′/2mm

Vertical Compensator

System	Liquid-electric detection
Compensation range	±3′
Resolving power	1″

Optical Plummet

Image	Erect
Magnification	3×
Focusing range	0.3m～∞
Field of view	5°

Display

Type	LCD，Four lines，digital

Data Communication

Port	RS－232C

On-board Battery

Power resource	Rechargeable Ni-H battery
Voltage	DC7.2Ⅴ
Continuous operation time	BDC 3000mAh Angle measurement: 20 hours Distance measurement: 8 hours

Operation Environment

Operating temperature	－20° ～＋45℃

Size & weight

Dimension	180mm×175mm×355mm
Weight	6.5kg

16. Packing List

●Case	1pc
●Main body	1set
●On-board battery	2 pcs
●Charger	1pc
●Plummet	1pc
●Correction pin	1pc
●Fur brush	1pc
●Screwdriver	1pc
● Hexagon wrench	1pc
●Cloth	1pc
●desiccant	1bag
●Operating manual	1pc

FUJIYAMA QUICK OPERATION SHEET.

Theodolite mode:

1.Switch instrument on.
2.Turn telescope.
3.Screen on display is normal theodolite mode.

Input coord data:

1.Press menu.
2.Press F3(Memory manger)
3.Press F3(Input coord. Data)
4.Press F1 and give file name(eg.Test 1)Move from numbers to alphabet by using the up and down buttons on keypad.Press F4 (enter) when done.
5.Pless F1 to input Pt ID name or nr.
6.Input ID if needed.(refrence points eg.tree)then press F4
7.Press f1 to input coord eg.E:-450987.00
N:265798.00
Z:1283.00
Press f4 enter when done.
You will see that it moved to point nr 2 if you want to change the name press F1 and rename. Keep on putting in your coord until you got all of them in.
Press F1 to view the files you input.

Collecting new points(Coord)

1.Press menu
2.Press f1(Collection data)
3.Press F1 for new file name or press f2 to find file name that you input in (INPUT COORD

DATA).For test we use F1
4.Press F1(Set Coord.Data)
5.Input station coord name by moving same as above.
6.Input instrument H by pressing F1
7.Press F4 to put in Coord.
8.If you have the coord saved press f1 to find if not press F4 again.
9.Input coord same as above(F1)
10.Press F2(Backsight)
11.If you have coord for BS press f1 if not press F4(Coord)
12.Input BS coord same as above (F1)
13.press F4 to enter.
14.press F1 to set H angle.
15.Press F3(Collection)
16.Input the point name you want to get the coord for(eg.2005)
17.Press F3(MEAS) to measure coord.
18.Press F4(Record)to record coord.
19.It will move to next point to find coord.

USING S.O(Set Out)
1.Press menu
2.press F2(S.O)
3.Press F2(List)
4.Search until you find correct file.
5.Press F1(set coord data)
6.Press F1 to input your coord nr;
7.Press F1 Search and press f3 to type in the name of station.
8.press f4 to set.
9.Press f2(Backsight)
10.press F1 to find your BS point.
11.Press F3 and input BS point name.
12.Press f4 to set.
13.Aim at the BS Point; VERY VERY IMPORTANT!!!!!!!
14Press set on H Angle.
15.Press F3 (S.O)
16.Press f1 to input Pt id
17.Press f4(Coord)
18.Press F1 andf3 input name to Set out.F4(enter)
19.See if coord is correct if ok press F4
20.Press F1 for angle reading or F2 for Meas reading.

Downloading:

ON PC First.

1.Go to window explorer.
2.Clik on cd drive
3.Right Click on File Tran click copy
4. go to file to where to download and press right click and past.
5.Go then to file and open software.

6.Search for correct port nr eg port 2 and press receive.
7.Do the same with send.

ON TOTALSTATION:

1.Press Menu
2.Press f3(Memory Manage)
3.Move to page 2 by using the keypad button next to the on button.
4.Press F2(Communication)
5.Press F1 to send data.
6.Press f2 and find your file you want to transfer to PC.

Changes made to download.

1.When downloaded from Totalstation ,Export to My documents or were ever and save as eg:FYTS.txt. Close FUJIYAMA software.
Go to Windows excel .File, open, select all file type, look for dadi.txt press open.
Click Next ,tick tab and Comma Block press next and finish.

When uploading to Total station;

Please remember it must be in same format eg.
PT ID MUST BE IN CAPITAL LETTER.

Nr	PtID	ID	N	E	Z	
	1	AB1		4.868	1.13	1.128
	2	AB2		4.868	1.13	1.128
	3	AB3		4.87	1.13	1.128
	4	AB4		4.869	1.13	1.128
	5	AB5		400	121	1.128

Then go to file save as and save as a .csv(Look in Save as Type)
Eg:FYTS2.csv. Then say Yes to pop up. Close and go to where it was saved. Look for dadi2.csv,right click and rename to dadi2.txt.Say yes to change.
Go to Total station software, press import chose file FYTS2.
The go to send data.

On Total station.

1.Press Menu
2.Press f3(Memory Manage)
3.Move to page 2 by using the keypad button next to the on button.
4.Press F2(Communication)
5.Press F1 to receive data.
6.choice file on totalstation to were to download if you have.
If not Create new file and save.